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CLEAN WATER. A CHALLENGE TO THE NATION

Public Health Service
Washington, D. C.

1960

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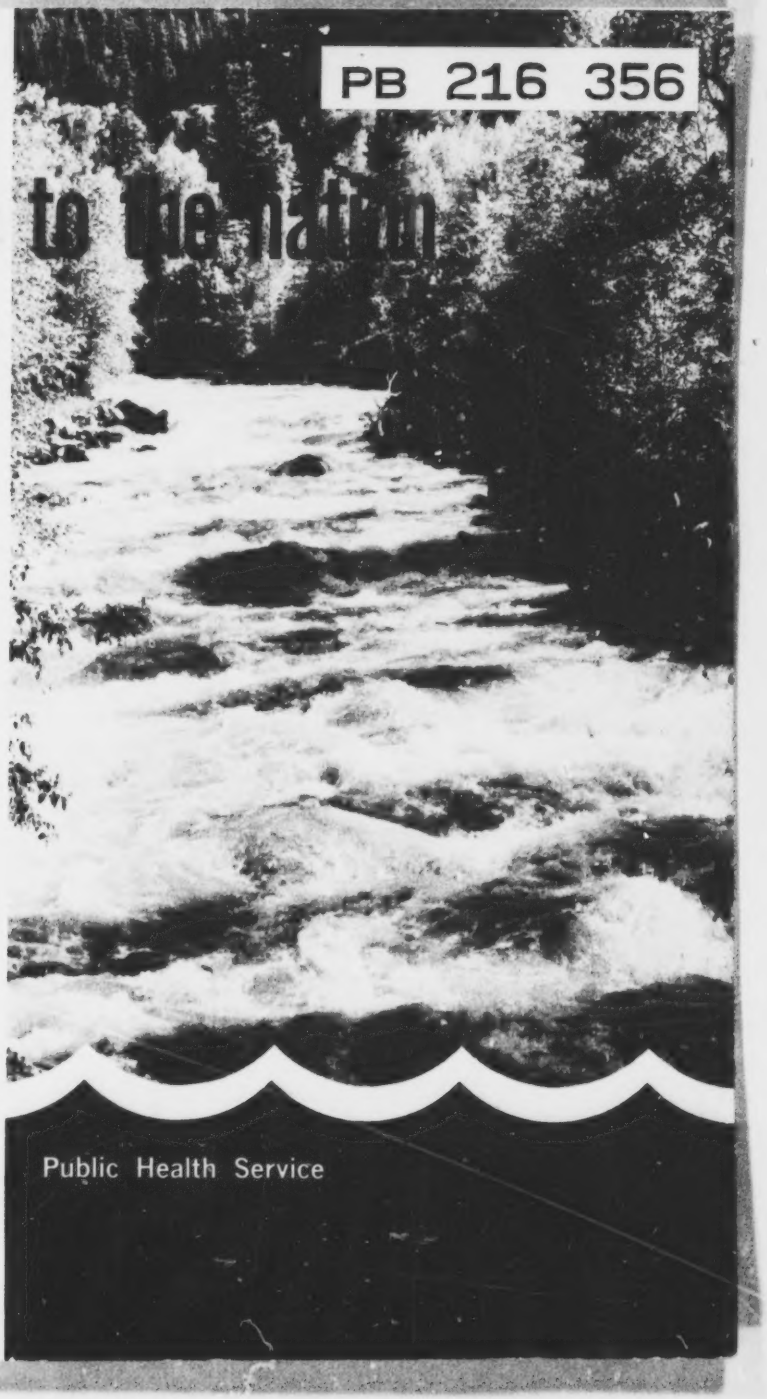
CLEAN WATER · a challenge to the nation

HIGHLIGHTS AND RECOMMENDATIONS OF THE NATIONAL CONFERENCE ON WATER POLLUTION



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U. S. DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE

Public Health Service

It is a pleasure to send greetings to the citizens assembled in Washington for the National Conference on Water Pollution. It is heartening to know that this conference has attracted such a splendid representation from across the land.

We in the United States are fortunate in having generally adequate amounts of rainfall over large areas of our country, but we waste much of this precious natural resource by water pollution. We cannot continue to do so and still have enough good water for the growing needs of our population, industry, and agriculture. Nor can we continue to expose our people to the health hazards of water pollution.

In asking the Department of Health, Education, and Welfare to call this National Conference, I stressed the mutual responsibilities of all segments of our society in cleaning up our waterways. We need appropriate action by Federal, interstate, State and local agencies. We need greatly expanded research, the continuing efforts of industry and agriculture, and, most important of all, we need the wholehearted support of the individual citizen. It is the business of the Conference to study and assess the problem of water pollution in all its aspects and to develop goals and programs that will assure progress in this field.

I am delighted to add my best wishes for a most successful meeting.

Dwight D. Eisenhower

SUMMARY REPORT

Highlights and Recommendations of the
National Conference on Water Pollution
Washington, D.C., December, 1960

CLEAN WATER

a challenge to the nation

Details of illustrations in this document may be better studied on microfiche.

U. S. DEPARTMENT OF
HEALTH, EDUCATION, AND WELFARE
Public Health Service

The National Conference on Water Pollution will affect the economic and public health planning of our Nation for many years to come. It held up to public view one of the critical problems of our time; it helped develop new information and fresh points of view about pollution control; and it focused attention on many different areas where new action is needed.

The Conference opened a few hours after the onset of the worst snowstorm to occur in Washington in many years, one which virtually paralyzed the city. Despite the weather, nearly 1,200 people registered at the Conference and took part in its deliberations. For their attendance and for their help in shaping its recommendations, they deserve the gratitude of the American people.

Leroy E. Burney

Leroy E. Burney, M.D.
Surgeon General

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INTRODUCTION

The National Conference on Water Pollution was called at President Eisenhower's request. In a message to the Congress, February 23, 1960, he stated that such a meeting was needed to "provide a forum in which all concerned can confront and better appreciate their mutual responsibility for solving this pressing problem."

The Hon. Arthur S. Flemming, Secretary of the Department of Health, Education, and Welfare, subsequently called upon the Public Health Service to organize the Conference and at the same time invited 37 distinguished citizens to serve as a Steering Committee to help and advise the Service. The committee was composed of highly qualified individuals representing municipal, state, interstate, industrial, civic, labor and women's organizations, and other citizens' groups having an interest in the water pollution problem. The committee met with the Public Health Service staff for the first time on June 22, 1960, and worked closely with it during the summer and fall. The Conference itself opened at the Sheraton-Park Hotel in Washington, D. C., on December 12.

This booklet presents the highlights of the Conference—excerpts from some of the principal addresses, reports of the various panel groups, and a final summary of Conference recommendations. It is not, nor can it be, a complete and balanced report of the Conference; for this, readers must wait for the final proceedings which will be published in the near future. But it may give an overall view of what went on during the three days of December 12, 13, and 14, three days which may have a lasting influence on American attitudes towards the management of water resources and the need for control of water pollution.

Conference Planning

Early in its planning for the Conference, the Steering Committee and the professional staff fixed upon four basic areas of concern in the field of water pollution control. These became, with only small change, the topics assigned to the four panel groups. The first was the effect of pollution on the Nation's health, welfare and economy; the second was the importance of water pollution control on the management of water resources; the third was the responsibilities of government, industry, agriculture and the public in combating pollution; and the fourth was the need for research and professional training.

The division fixed upon by the Committee and staff worked well. It was possible to obtain four outstanding people to serve as panel chairmen and with their help, to build self-sustaining and effective programs. The chairmen, whose reports are presented in this booklet, were the Hon. Thomas A. McCann, Mayor of Fort Worth, Texas, and a member of the Water Pollution Control Advisory Board; Dr. E. A. Ackerman, Executive Officer of the Carnegie Institution of Washington, D. C.; Dr. Abel Wolman, Professor of Sanitary Engineering at The Johns Hopkins University, Baltimore, Maryland; and Dr. Gordon M. Fair, Professor of Sanitary Engineering at Harvard University, Cambridge, Massachusetts.

The four panel sessions ran concurrently on the second day of the Conference; on the first day, one plenary session was held and a banquet at which outstanding members of Congress spoke. On the third and final day there was a plenary session for closing remarks and Conference summary.

The Conference was conducted without the adoption of formal resolutions. Reports and recommendations were prepared by subcommittees which are listed elsewhere in this document. The subcommittees were chosen in such a way as to insure that all interested groups were represented. Following each panel session and summary report an opportunity was provided for comments from the floor. This Summary Report contains only the reports of the subcommittees. Floor discussion will be found in the proceedings.

The program set up during the summer and fall suffered one defeat as the result of the winter weather beginning on December 11. It was necessary, in the face of a crippling snowfall, to forego the opening morning session and to postpone the scheduled address of Secretary Flemming to the final day of the meeting. In all other respects the program went on as originally planned.

Public Information

A basic part of pre-Conference activity was the carrying on of an intensive public information program to focus attention on the problem of water pollution and to increase public awareness of the need for its control. The Conference staff published a monthly Bulletin, as well as a series of leaflets covering the effects of water pollution on recreation, on fish and wildlife, and on the public health and welfare. A chart book was also published and distributed at the time of the Conference and other promotional material was planned.

The Steering Committee was helpful not only in planning and directing the Conference, but also

in developing the public awareness program. Organizations represented on the Steering Committee distributed Conference material to their members, published a great deal of information about the Conference in their own magazines and journals, and in some cases carried on cooperating publicity programs. A number of other organizations and groups not associated with Conference planning also contributed to the information activities, most notably the Advertising Council, the National Association of Broadcasters and the Outdoor Writers' Association. John Charles Daly contributed greatly to the radio and TV information program.

The Conference itself was widely publicized in the press and on radio and TV during its three days of sessions.

Accomplishments

It is too early to assess what the long-range impact of the Conference may be. Three things, however, seem apparent—the Conference brought new public attention to the problem of water pollution; it reached agreement on many significant issues connected with water pollution control, and, finally, it identified two major areas of disagreement.

The first of these areas of disagreement concerned the Federal Government's role in pollution control. An examination of Conference minutes shows no serious questioning of the need for a Federal program and no serious questioning of the general areas in which this program should function. But there was sharp divergence of view, reflected in this booklet, on what the extent of Government activity should be.

There was also uncertainty among Conference participants on the standards of cleanliness which should be set for our rivers and streams. What is economically feasible for a community, a river basin, or a nation to insist upon? What safeguards should be set against some of the newer pollutants, and what safeguards should be set against the use of chemicals which will eventually reach our water supplies?

If no agreement could be reached on these major issues, very considerable agreement was possible on a number of others—the need for more research and basic data, public awareness, keeping water as clean as possible, comprehensive river basin development, a need for stronger State leadership, the important responsibility of the Federal Government in research and technical assistance, and the need for more and better trained manpower. Published in this booklet are the 30 recommendations which were developed by the subcommittees and presented to the Conference group for comment. They represent the consensus of informed and highly interested persons representing every significant point of view on water problems.

The final accomplishment of the National Conference is the one which may in the end have the most effect upon how we use our water resources in the future. The Conference, in six months of planning and in three days of actual session, brought new national attention to the need for the control of water pollution in the United States.

As Executive Secretary of the Conference, I should like to express the thanks of the Public Health Service to members of the Steering Committee, to Conference speakers and participants, and to my fellow members of the staff.

Frank A. Butrico
Executive Secretary
National Conference on Water Pollution

Opening Plenary Session

DECEMBER 12, 1960

CLEAN WATER

Dr. Leroy E. Burney
Surgeon General, Public Health Service

A MATTER OF SURVIVAL

Albert E. Forster,
President, Hercules Powder Company

POLLUTION IS A PEOPLE PROBLEM

Dr. Ira N. Gabrielson,
President, Wildlife Management Institute

WATER POLLUTION IMAGE

Mark D. Hollis,
Assistant Surgeon General
Chief Engineer
Public Health Service

CLEAN WATER

by Dr. Leroy E. Burney

Surgeon General, Public Health Service

(Excerpts)

This Conference is one of many heartening indications that the American people are coming to a full recognition of the realities of our technologic age. To a far greater extent than ever before, we live in a man-created and man-controlled environment. It is within our power to shape our own future, to guide the evolving patterns of society and determine the nature of the surroundings in which we and our children will live.

Few if any problems are more intricately interwoven into the fabric of our society than the control of water pollution. Clean water is essential to life itself; it is essential to our industrial technology, and to agriculture; is essential to the conservation and use of the many natural resources upon which the richer life depends.

Federal Viewpoint

In describing the water pollution picture from the viewpoint of a Federal health agency, I should like to develop four principal points:

First, that water pollution control is an integral part of the broader problem of water resource development and use;

Second, that water pollution control is an inseparable part of the broader problem of environmental health protection;

Third, that an impressive amount of productive activity is already underway in controlling water pollution;

And fourth, that the problem demands a still stronger effort on the part of Federal, State, and local authorities, industries, and all others concerned.

An Economic Imperative

All of you are well acquainted with the overwhelming statistics on water usage, both today and in the foreseeable future. Already, in many areas, there is not enough water to go 'round. To cite one outstanding example, it is estimated that the water in the Ohio River, at times of low flow, is used almost four times as it flows from Pennsylvania to the Mississippi. It is at this point of reuse, of course, that the threads of water quality and water quantity become inextricably interwoven. And it is at this point also that considerations of national health enter the equations.

A Biological Imperative

There is no room for doubt that we are presently passing through a second industrial revolution. Its by-product wastes and side effects threaten a new kind of health problem for our own and future generations, caused by the environmental pollutants and conditions to which we are continuously exposed every day of our lives—the chemicals in the water we drink, the food we eat, and the air we breathe, plus ionizing radiation from both natural and man-made sources.

I do not intend to suggest, of course, that our microbiological problems are solved, once and for all. I do wish to emphasize, however, that in the public health professions we stand at the microchemical frontier.

We know that the biological effects of some chemicals in our environment, and of low-level radiation, may build up over long periods of time. The hazard to the individual may well be related to the cumulative total of radiation or toxic chemicals received throughout his lifespan, continuously or intermittently, whether their source be water, air, food, or any of several others. A substance like lead, for example, coming from such sources as agricultural sprays and automotive exhausts, is present in food, water, air, and tobacco.

The effect on human health of the contemporary environment cannot be neatly packaged in mutually exclusive categories labelled water pollution, air pollution, radiation, occupational health. The individual's health is, at root, indivisible. The total environment has a cumulative impact upon it.

Progress in Pollution Control

The present Robert A. Taft Sanitary Engineering Center is the largest research enterprise of its kind in the world. Among its recent accomplishments has been the development of new and extremely sensitive devices to extract and identify organic compounds in extremely small amounts. Other developments at the Center include new criteria for using sand filters in water treatment plants, and a successful pilot project of a sewage treatment procedure applicable to housing subdivisions beyond the reach of metropolitan sewer systems. Among the many basic problems now under study are methods of identifying compounds present in wastes and determining whether or not these compounds can be successfully assimilated by the treatment plant or the stream.

We recognize, of course, that even this greatly accelerated research effort is only a beginning. Research must be expanded and diversified manyfold, not only in Public Health Service installations but also at universities and other research centers throughout the land.

Basic Data

The Public Health Service has initiated a long-range basic data program which includes among others: (1) A national network of 75 stream sampling stations, to be increased eventually to 300, on interstate streams to measure water quality; and (2) Inventories of water, sewage, and industrial waste facilities in the United States, published at regular intervals.

Interstate Enforcement

Where pollution of interstate waters endangers the health or welfare of persons in a State other than the one in which the pollution originates, the Surgeon General and the Secretary of Health, Education, and Welfare are empowered to take action to abate pollution. Enforcement actions have been taken thus far in 13 interstate pollution situations, involving more than 4,000 miles of streams. The remedial measures agreed upon will include the construction of some $500 million worth of waste treatment facilities.

Construction Grants

A total of 2,483 sewage treatment projects have been approved for Federal construction grants from 1956 through November 30, 1960. Of these, 1,246 are completed, 717 are under construction, and the rest are awaiting construction. They received grants of $205 million, and the total project costs were $1.2 billion. The stimulating effect of the Federal grants is seen in the better than 64 percent rise in sewage treatment plant construction since the grant funds became available.

Program Grants

The Federal Water Pollution Control Act authorizes $3 million a year for five years as grants to help support State and interstate pollution control programs. The States are required to pay from one-third to two-thirds of the costs of these programs. In general, the States have been able to expand their operations, and some have initiated new research and stream surveys as a result of the grants. Appropriations by the States for water pollution control activities have risen from $4.2 million (in 1956) to $6.5 million (in 1959) since the program grants became available.

Training

The Public Health Service offers advanced training for engineers, chemists, and other scientists and technicians from Federal and State agencies,

municipalities, industries, and foreign countries, as another of its services designed to aid the States and other allied agencies and organizations.

The Shape of the Future

There has been genuine progress in pollution control. There has been a heightened willingness on the part of the many agencies and groups concerned to assume their rightful responsibilities. In short, there is cause for encouragement.

There is not, however, cause for complacency. The condition of our waters is a national disgrace. It is tragic for the world's richest, most powerful and most technologically advanced Nation to foul its own nest, limit its own growth, and threaten the health of its people.

Plainly, the most fundamental responsibility of all rests at the source—with the municipalities and industries concerned. Our success or failure in pollution control will be proportional to the application of control measures by those who discharge wastes to the waters.

Clearly, too, the States must continue to be keystones of our pollution control efforts. Historically, legislatively, and logically the strength of the State agency is a major determinant of success in pollution abatement.

Finally, there is an unmistakable Federal responsibility derived from the national scope and enormous complexity of the problem itself—a responsibility for leadership in research and investigation, for contributing to an enlightened awareness on the part of both the public and the professions involved, for aiding and strengthening programs at State and local levels.

Water pollution control is a national problem of the first magnitude, both in its relationship to water resources development and in its involvement with man's health. It is not, however, an insuperable problem. In a Nation such as ours, we can find enough money; we can develop enough scientific and technological capability, enough public concern, and enough mutual confidence and good will to reach a balanced solution.

A MATTER OF SURVIVAL

by Albert E. Forster

President and Chairman of the Board, Hercules Powder Company, Wilmington, Delaware

(Excerpts)

The responsibility for solving the water pollution problem belongs to each individual American, working in community with his neighbors until it becomes one all-consuming national effort. Every American contributes to the problem simply through the fact of his existence, and because of his insistance on a high standard of living.

The seriousness of the water situation is the fault of no one group or organization, yet every one of us is responsible for depleted stocks and increased requirements. Trying to point the finger of blame may be easy and tempting but is utterly devoid of constructive criticism.

Recently there was proposed a three-part water management program in the Pacific Northwest. This was an industry-oriented program, one which I whole-heartedly endorse because it takes into full account the equities of all water users. This program would perform the following three steps:

1. By areas, the present and future beneficial water uses of an area would be determined and enunciated. These uses most certainly would include the disposal of industrial wastes as a legitimate water use.

And at this point I would like to emphasize the word "area". Water problems differ sometimes radically from one area to another. The answer to a problem in Delaware might be totally inadequate in California. For that reason the first step toward any solution of water resources problems must begin within the area, whether that be a municipality, State, or geographic region.

2. Water quality criteria would be established to protect these uses—criteria which would allow maximum use and reuse of the waters.

3. A program of monitoring to maintain required standards would be established and carried out.

This proposed program springs from a self-centered motive—the motive to survive. It is proposed by industry which is facing tremendous problems of industrial waste disposal. It is carefully thought out and it preserves the equities of all concerned.

Reuse of Water

We are apt to overlook the tremendous extent to which the reuse of available water now makes the same million gallons of water serve many masters. It is estimated that the present reuse of water by industry approaches 100 percent, and that this may be expected to rise to 400 percent in the future—that is, one gallon of intake water would be used five times.

It is obvious to those of you here today that conservation of water by dams and reserve stocks

along our great rivers will assist materially in the near future both for supply and pollution control. I think it is also obvious that the de-salting of sea water on a cost basis which we can bear will become a reality before too long. Neither of these factors, however, will obviate the present and future need to reuse the water we have many times over.

I would like to submit for your consideration a program and philosophy I believe must be embraced in order for us to succeed as a Nation in solving our water resources problem.

My first and most important proposal is that water resources and pollution control be considered on a State level, with funds, manpower and dedication as important as highways and schools.

In too many States, attention has been put to these problems only when everything else has been budgeted, if indeed any action at all has been taken. What's left over provides a pitiful amount of money to engage the services of too few professionals in this field. And the whole program, small as it is, is stripped of any authority to do anything because the States' lawmakers are so blind to the critical urgency of it.

In most all of our States, the greatest emphasis, attention, money, and public support is given to highways and schools. Certainly, better schools and highways are needed, and undoubtedly more money can be wisely spent on each of these items. But at the same time, we must allocate more to water resources if we insist upon continuously raising our standard of living.

Therefore, I say that each State should have the necessary facilities, empowered by the necessary laws, and staffed by the best engineers, so that the over-all problem is licked first on the State level and working closely together with other States or interstate agencies on a regional level. Guiding this development of state and regional control should and must be the Federal Government, acting very much as our research and development team in industry does.

State and interstate control agencies must be able to call upon the Federal Government for guidance and counsel. A duplication of research effort on the State level would be impossibly costly and futile of any great achievement, since there are not enough trained personnel to go around.

Furthermore, the science of sanitary engineering is finding it increasingly difficult using known methods to solve some of the problems now being faced. New ones are cropping up every year.

Therefore, my second proposal is that a vastly increased research effort be brought to bear immediately upon the water pollution problem under the guidance of the Public Health Service, utilizing to a far greater extent than is now done the research programs being carried out by industry and private foundations on this common problem.

Coordinate, I suggest, all of the existing extensive research done on water pollution, find in that manner where more is needed, and then organize all of this knowledge and talent so that it may be immediately available and usable to anyone.

What will it take to carry out this research? Public Law 660 of 1956 now provides for a broader research program within the Public Health Service and for greater Federal cooperation on these areas through research grants, research fellowships, contract research and training. In addition, it provides for strengthening the broad research program within the Public Health Service.

This is now being utilized to the extent consistent with appropriations being made under the law by Congress. It is evident that these are insufficient. Therefore, increased funds should be made available by Congress so that these programs in research can be implemented at a greater rate.

My third proposal, I sincerely believe, holds the key to success or failure of our common effort. I said at the start of my talk that the problem of water management in the United States is the responsibility of every citizen. Until a majority of our citizens are convinced, first that a problem does exist, second that we have no choice but to find a solution—and soon—and third that they must assume their share of responsibility in the solution, we as a Nation will fail short of the solution required.

Information Program Needed

In simple words, I am suggesting that a well planned information and education program must be launched and carried through to success if we are to solve our water resources problem.

This program of information and education is another example of a job too big for any one of us alone. We must establish a common ground of attack, pool our resources, our available skills and funds, and then move on all fronts at one time to convey in many forms, and using many media, the vital importance of water conservation.

Government on a Federal, State and municipal level, industry and the citizenry, must work out together the management and improvement of this resource in order that we may continue to live and grow and prosper.

In the last few decades, I submit that industry for the most part has not only assumed its responsibility in the conservation and safekeeping of water supplies, but has done so at a faster rate than many municipalities so anxious and eager to have industry as a neighbor.

The chemical industry, which I represent, has been outstanding in its program of water pollution control. In the past year alone, more than a hundred million dollars has been spent by the chemical industry of the United States on water pollution control.

Some of it has been done by edict, and I will be the first to admit that there are now—and perhaps always will be—those members of the business community who require the harsh arm of the law to make them act as good citizens.

I am gratified that most of it has been done voluntarily. The recalcitrants, like the bad apples in any segment of our society, and each segment has them, should be treated as the exception to the rule and not be allowed to blemish the reputation of the majority.

In developing a total approach to adequate water supplies, we must consider maximum utilization of our flowing streams. No longer can we afford the economic loss from recurring periods of flood, or the waste of this water so necessary for implementing dry weather flows. Regulation of flow throughout the year will provide additional summertime volume, thus increasing the assimilative capacity of the stream as well as providing additional volume for use by all.

Such a program for harnessing our streams is one which must encompass an entire watershed and which would affect several States. It is therefore, one in which Federal participation must be considered. In such a national approach to our water resources problem, flood control, power generation (where feasible with flood control), flow regulation, and recreational use must be completely correlated for maximum use consistent with the economic benefits to be derived.

POLLUTION IS A PEOPLE PROBLEM

by Dr. Ira N. Gabrielson

President, Wildlife Management Institute

(Excerpts)

The public to which casual reference sometimes is made, and whose viewpoint I was asked to express today, is the sum total of all the people who use water. It extends from householders to farmers, from industrialists to recreationists, and from city planners to businessmen who try to accelerate community and State development and advancement.

Regardless of position and affluence, we share a common need for adequate supplies of uncontaminated water. We benefit from water that is clean, and we are penalized by that which is dirty. This is why I say that water pollution is a problem of the people.

The head of the family ends up paying the bill regardless of the pollution-control philosophy that is followed. He pays it in the form of extra cents on his shopping bills when the costs of industrial water treatment facilities are passed to the consumer. He pays the cost as taxes which are levied to underwrite municipal, State and Federal programs.

The people pay in another way when pollution abatement responsibilities are ignored. They pay by having to live with recurring water shortages, blighted neighborhoods, impaired health, loss of industrial, business, and real estate revenues, and sacrifice of social, cultural, and recreational opportunities. When waste treatment belatedly comes to those many areas where it has been delayed, the people still are going to be out-of-pocket.

Some appraisals of the threat of water pollution overlook achievements that have been and are being made by industry, agriculture, and local, State, and Federal units. Progress has been made in a number of important ways.

The record shows clearly, however, that these efforts collectively fall short of the mark. They are too few and too isolated to have substantial impact.

Much more must be done. Research must be accelerated and the findings applied. Industry should recognize pollution abatement as a regular operational expense. Clean water requires substantial expenditures at all levels.

A contributing factor to the present dilemma is the number of people who persist in viewing watercourses as sewage and waste disposal channels regardless of the difficulties imposed on others.

Inspired, dedicated, and as well equipped as the staff personnel may be, State programs are hampered by the unwillingness, reluctance, or inability of the legislative bodies to provide necessary appropriations. Funds for State agencies have about tripled in the last decade, rising from $2.2 million in 1950 to $6.5 million last year. The average State and jurisdictional investment in 1959 was approximately $130,000, a grossly inadequate sum. This weakness is further underscored by the realization that 40 percent of the $6.5 million was invested by four States.

The Federal contribution to State programs last year was $2.6 million. Federal funds have comprised between 28.7 and 29.5 percent of the State's programs during the past three years. The record also shows that State investments fell off during the years 1953-56 when Federal assistance was not available.

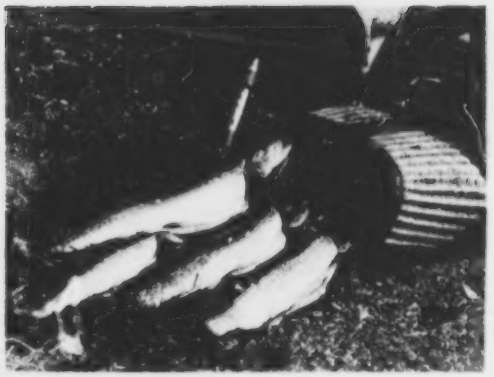
Federal grants and assistance programs to the States are not recent innovations. The first began in the 1870's.

It is my personal opinion, and one which apparently is held widely, that the Federal program of grants-in-assistance for the construction of pollution abatement facilities presently is one of the best approaches to this national dilemma that is making clear water a scarce resource.

Federal Investment Vital

Federal investment for the protection of our surface and ground water supplies is fully as vital to our national life as are expenditures for defense, post office, transportation, agriculture, and others.

Only three States have substantial grants programs for assisting municipalities in meeting their responsibilities for constructing water treatment facilities. State leadership towards solving water



pollution problems continues to lag. And the dim prospects for any greater participation appear to be the principal reason for the vigorous support of the Federal program by State water pollution control administrators and sanitary engineers.

Water pollution control has outgrown its classification as primarily a public health problem. Pollution now rates full membership in the vexing relationships that dominate the entire water resources field. Freeing water of contaminants and preventing the introduction of additional pollutants is an overriding water resources challenge of this century. This technological and construction gap cannot be denied parity with flood control, storage, navigation, and irrigation.

There is concern about the "Final Report of the Study Group on Mission and Organization of the Public Health Service," dated June 7, 1960, which recommends inclusion of the water pollution control functions in a Division of Water Supply and Pollution Control in a new Bureau of Environmental Health. Five of the six divisions of this

bureau would incorporate functions and responsibilities of existing organizational units. This plan offers no boost for water pollution control. That activity already has divisional status. Other activities, such as air pollution and occupational health, which presently have only branch and program status, would be elevated to divisions. This recommendation clearly falls short of public expectations. Pollution control would remain a subbasement activity with a mission that is primarily directed toward public health. The published public record makes doubtful Congressional acceptance of this report.

Extensive amendments to the Federal Water Pollution Control Act are being readied for introduction in the 87th Congress. These proposals most likely will include the status of the program within the Federal establishment, construction grants to municipalities, program grants to States and interstate agencies, extension and strengthening of Federal enforcement, and the control of pollution from Federal installations.

Several points whose acceptance by all water users would do much to assist in achieving pollution control objectives are:

1. A national system of water quality standards from a health, recreational, industrial, and aquatic life basis should be developed and accepted by all units of government. These standards should be enforced vigorously and uniformly. Damage and loss should not be required as proof of pollution.

2. All users of water have the responsibility of returning water with all wastes removed from it that can be achieved up to and including ultra-cleansing where required. The national objective should be to keep pollutants out of streams. The design capacity of treatment systems should be computed for maximum treatment of wastes independent of the estimated capacity of streams to absorb and stabilize wastes.

3. Users of water do not have an inherent right to pollute. A desire for clean water was the foremost viewpoint expressed in communications from national membership organizations.

4. Public awareness programs should be expanded at all levels.

5. The public should insist that all jurisdictions accept and fulfill responsibilities to protect the national well-being by keeping surface and ground waters free of pollutants.

6. Pollution control objectives should be achieved by use of construction grants for waste treatment facilities, tax amortization incentives, watershed erosion control measures, and strengthened law enforcement at local, State, and Federal levels.

7. States and municipalities should be encouraged to participate more fully in water pollution control activities. Federal persuasion and leadership should be provided to obtain acceptance of local and State roles where necessary. The Federal Government does have responsibility for research, enforcement, grants assistance, and other necessary activities.

8. Federal assistance should be conditioned on guarantees of stronger State programs and improved participation in pollution control activities.

WATER POLLUTION IMAGE

by Mark D. Hollis

Assistant Surgeon General and Chief Engineer

Public Health Service

(Excerpts)

If we agree that water pollution results from concentrations of people in a progressive dynamic economy, then certainly it should surprise no one that we have today an involved and complex problem. This is simply in keeping with the tenor of the times. A requisite need, perhaps, is to break down barriers of provincialism, the prejudices of proprietary interests, and varieties of narrow traditional points of view, too commonly shared by so many of us.

What is now important, it seems to me, is to see whether this National Conference can stimulate something beyond a cool air of co-existence; to see if we can modify the spirit of competing interest, of conflicting interest—to something more

akin to a spirit of allied interest, of common goals and common objectives; to remove the feeling of incompatibility between the reasonable protection of the Nation's waters and the obvious necessary use of these same waters for the final disposal of liquid wastes.

As we look ahead two decades, by 1980, the urban population will be in the 200 million range. The population depending on surface streams for drinking water will be about 165 million. The sewered population will be at 200 million. We assume all waste will be treated. Average stream flows will be the same. For most streams the waves of pollution shocks will become somewhat additive —there will be little time for the stream to recover between such shocks. Distances between waste outfalls and water intakes will be wedged closer and closer together. Hundreds of new type, more persistent pollutants will further complicate the situation.

The pollution image will broaden and likely it will darken. At the same time water needs will spiral upward toward astronomical figures. Repeated reuse of waters will become the rule—not the exception. Three-fourths of the 1980 population will live in metropolitan areas. Six-times reuse of the same water must be anticipated. What then will water quality be like? What will the stream environment be like? What about recreational and aquatic values? These are pertinent questions.

Let's remember that waste treatment is partial treatment—not purification. Treatment is designed to condition the waste and reduce its pollutional shock—with the stream completing the job. For most areas, this concept is still workable and will so remain for the predictable future. Economically this is important, because costs are quite high for advanced stages of treatment. On the other hand, in some areas, the composite residual loadings after treatment are already overtaxing stream capabilities. This situation will become common in the years ahead. Improved treatment will be needed. This is one of the several new situations we must face as we move toward our bright new world.

Today metropolitan and industrial wastes are huge in volume and include increasing amounts of new type synthetic chemical contaminants. Most of these wastes were practically non-existent in 1940. Now they are present in concentrations up to 500 parts per billion in several major streams. These synthetic organics do not break down like natural organics; they are persistent over long periods, and to a considerable extent, they are not removed either by sewage treatment or by normal water purification practices. We have much to learn about the behavior of these new contaminants in streams, their relationship to natural stream purification phenomena, and their long-range subtle effects on public health, on aquatic life, and on municipal and industrial water supplies. They add the question of toxicity to the age-old problems of typhoid fever and similar diseases.

Cannot Ignore Pollution

This aspect of the pollution situation is characterized more by what we don't know than by what we do know. This is not the type of problem that should be "swept under the rug" and forgotten. It needs to be in the open and it needs to be worked on. For when we project trends for a decade or two this aspect of pollution does have sobering implications and creates a real sense of urgency for research action now. The public health aspect of water pollution again moves front and center.

Prevent, Do Not Correct

Let's remind ourselves that we are in the midst of an era of accelerating change—with increasing tempos affecting almost every facet of our daily lives. Pollution control in the past has been largely corrective. In the future it must be preventive. Remedial measures must replace corrective actions. The tenor of the times and the complexity of the problem simply outmode the philosophy of postponement. The present so soon becomes the past that continually, from here on, we must work with a critical eye to the future.

We must remember too, that when we speak of 1980 or 1990, no longer do we mean some far distant dim future that the next generation might worry about. On water pollution, the need for clear concepts and principles, for stepped-up research and bold action cannot be postponed. This need is not tomorrow—it is today. Perhaps even it was yesterday.

We must recognize that we cannot enjoy the great advantages of modern technology without accepting some of the consequences. Pollution is one of these. But the pollution impact from human activity in these areas of "wall-to-wall" people can be moderated—and it must be moderated. How clean and pure we attempt to maintain our streams is a matter of economics and realities, and of values both tangible and intangible. If our objective be pristine purity for purity's sake, we can easily "price" ourselves out of progress. On the other hand, if our objective

be solely the dollar sign, continually to undercut the necessary cost of controls, we can easily "prosper" ourselves out of critically essential water resources. Between these extremes come the tough hard choices.

To say it costs too much to prevent excessive pollution is just plain nonsense. But we do need a clear understanding and a clear definition of "excessive". Obviously, pollution *must* be kept below the levels of significant personal health damage. It *should* be kept within bounds that do not destroy recreational and wildlife values. It is *desirable* to keep pollution within bounds which preserve the natural stream habitat. For every stream, each of these levels has its corresponding price tag—and you can be sure that the cleaner and purer, the higher the cost. And present cost will move upward where there are ill-advised, indiscriminate watershed developments.

In other words, while there are limits to what can be accepted as technological progress, there are also limits to how far such progress must, or will, yield to desirable but less than critical aspirations. The difficulty always lies in identifying limits. Certainly these cannot be generalized—necessarily they will vary, from area to area, and from stream to stream, depending on the state of development and other realities. This emphasizes the need for development of truly comprehensive water use programs—basin by basin—with some means of assuring strict adherence to the agreed-upon plans and objectives. With a few exceptions—this we now do not have.

In these times we must learn to run faster and faster to stay in the same place. Annual construction should be $600 million—up 50% over the current rate—to take care of the backlog, the increasing sewered population, and obsolescence—the latter will increase substantially in the sixties. Assuming the industrial waste load as equal that of municipalities—and certainly it is no less—this means a construction rate of more than a billion dollars per year on into the future. There is no substitute—we might as well face it.

In the backwash of all these tidal waves, at least five factors need to be underscored:

1. There is less and less justification for any city or industry to discharge untreated sewage and waste to the waters of the United States—especially the inland waters.

2. For most cities and industries, the treatment requirements will shade upward from primary treatment to at least secondary treatment.

3. It is important promptly to accelerate the rate of constructing treatment works to the level required to erase backlog and to keep up with growing needs and obsolescence.

4. We need a substantial program of research with three primary objectives:

   a. To assess the public health significance of the growing array of new-type contaminants.

   b. To develop practical methods for measuring and for removing dissolved pollutants—for application where wastes have serious toxic potentials.

   c. To develop practical supplemental treatment methods to stabilize further the effluents from conventional treatment. This is for application in those areas where stream use justifies almost completely stabilized organic discharges.

5. Considering pollution from all sources—there is real need to update the national system of monitoring streams.

In water pollution we all have much in common and much at stake. Water pollution control is now big business—it's important business and it's urgent business. On a tonnage basis, waste treatment is, by far, the biggest business in the United States. In far too many areas it has been a neglected business—out of sight, out of mind. The only way to control pollution is to treat wastes, and this costs money—lots of money. With few exceptions, this money is not willingly spent. Hence, public understanding is essential. And this must be backed up by effective regulatory controls.

This points up the great need for public understanding and public awareness. We have a challenge and an opportunity to speak out on this pollution situation. Our objective should be to alert, not alarm—to clarify, not confuse. As we move ahead, let's keep Mr. Citizen in mind—because so much depends on what he thinks, and wants, and is willing to pay for.

The Legislator Looks At Water Pollution

BANQUET—DECEMBER 12, 1960

Presiding

Dr. Leroy E. Burney

Master of Ceremonies

John Charles Daly, Member, Water Pollution Control Advisory Board

Speakers

Hon. Robert S. Kerr, United States Senator

Hon. Francis Case, United States Senator

Hon. John A. Blatnik, United States Representative

Hon. William C. Cramer, United States Representative

Senator Robert S. Kerr, of Oklahoma, Chairman of the Senate Select Committee on National Water Resources.

(Excerpts)

We must no longer endanger the national health or survival by permitting a price tag to prevent action. We must do what is required. I believe this will be the attitude of the new Congress and the new Administration.

The time for just talk has long since passed, and I am sure that everybody here is fully aware of that. Vigorous action at every level of government has long been an urgent necessity, and becomes more so daily. But, for whatever reason this Conference was called, it can, and will, accomplish something real, by spurring the necessary action. We in Congress need your support to get this job done. Why isn't this the time and place to start an organized campaign?

New Pollution Bill

On the opening day of the 87th Congress I will introduce another pollution bill with the added feature of a stepped-up program of research.

[EDITOR'S NOTE—Senator Kerr has introduced the new legislation which includes an increase from $50 million to $75 million annually for the Federal matching funds to help construct municipal sewage disposal plants. The ten-year total authorization would be $750 million.]

Thus far, research has been so inadequate that the question of pollution elements, not yet identified, may be as serious as the problem of neutralizing and handling the pollution already known to exist. Therefore, greater research is an absolute necessity, not as a vehicle for passing the buck, or as a justification for delay. It is a necessity as a means to find ways to better abate pollution, and to do it more rapidly at less cost.

I quote "conservative sanitary authorities" who say that $600 million annually for the next 8 years is the minimum required for the construction of disposal facilities of human sewage alone. Added to this is the cost of handling industrial and natural pollution, plus the maintenance of a steady flow of water for waste dilution.

The problem of water pollution, like that of municipal water, is primarily a local responsibility. Both Federal and State Governments must provide leadership and assistance. At the Federal level, "I intend to do all I can to help pass the necessary legislation to provide both incentive and enforcement."

[EDITOR'S NOTE—Senator Kerr, pointing out the need to dramatize the menace of water pollution, suggested facetiously a "mermaid with a broom" as a popular symbol necessary to awaken the Nation to the need to clean up its streams. Such a symbol, he said, would do what Smokey Bear and the Litterbug label have done to alert the public to the need to combat forest fires and to prevent littering of streets and highways.]

Banquet Toastmaster John Charles Daly, radio and television broadcaster, as a member of the Water Pollution Control Advisory Board, will be one of those advising the Surgeon General on implementing many of the recommendations of the Conference.

Senator Francis Case, of South Dakota, ranking minority member of the Senate Public Works Committee.

(Excerpts)

In addition to the millions of cubic miles of ocean water, how much more salt and otherwise minerally-polluted water exists in underground pools and streams, I lack the imagination to estimate. But our knowledge of artesian supplies and shallow wells that are heavily saline in character indicates that a tremendous reserve does exist when man achieves the conquest of desalination and demineralization.

We are at work on this job. In 1952 Congress passed a bill which authorized a program of research contracts with private and public institutions in the desalination of water. It attracted little general attention at the time. We had difficulty getting appropriations. I recall once when a Boston scientist was being badgered by questions as to what he would do with the money, he asked: "If I knew what we would find out," he replied, "we wouldn't need the research."

But we did get some funds and in 1953 research contracts were made with some of the organizations or institutions which had shown some interest in the field.

First thoughts were of sea water because of its abundance. California Congressmen Fletcher, McDonough, Phillips, and Engle, the latter now Senator, had all pushed bills on the subject in the House. Senators Anderson of New Mexico, O'Mahoney of Wyoming, Cordon of Oregon, Hayden of Arizona, Wiley of Wisconsin, and Johnson of Texas, were among those most active in the Senate. My special interest stemmed from a fairly intimate acquaintance with alkali water and its brackish cousins in the arid and semi-arid regions of the West.

The initial program was organized in the Interior Department by David Jenkins of Ohio. Subsequently, Secretary Seaton created a full-fledged Office of Saline Waters and placed former Nebraska Congressman Dr. A. L. Miller in charge. His professional knowledge and energetic direction have done much to bring the program to where it now is—one of the most promising and constructive activities of the Federal Government in the whole field of water conservation and utilization.

Research contracts on various processes have been carried on with both oceanic and inland waters. In 1955 we extended and expanded the original authorization. By 1957 a number of processes showed real promise. Senate committee hearings developed testimony which supported the belief that results warranted practical, full-size demonstration plants. In 1958 Congress passed and President Eisenhower approved a bill to authorize five practical-size demonstration plants—three to deal with sea water, two to treat inland brackish waters.

Program Now Underway

This program is now under way. The location and the processes of each one are revealing as to the nature of this water pollution problem and the range of solutions.

Plant No. 1 is now 40 percent complete at Freeport, Texas. It will convert 1,000,000 gallons per day of Gulf waters into potable drinking water at an estimated cost of 97 cents per thousand gallons. If increased to a 10 or 15 million gallon capacity, the cost can be cut in half, it is believed. This plant will use what is known as the long-tube vertical distillation process.

Water From Pacific Ocean

Plant No. 2 will be at Point Loma, San Diego, California. Ground-breaking ceremonies are being held December 19, 1960. It, too, will produce 1,000,000 gallons per day, using water from the Pacific Ocean in a multiple-effect evaporation process.

Plant No. 3 will be at Webster, South Dakota. Contracts for it have recently been signed and construction will start in the spring. This plant, using electro-dialysis with water passing thru membrane stacks, will treat waters that are about 2,200 parts per million in solids. Many towns of the West have a constant battle with such waters that eat out or clog water pipes and sewer lines with a variety of effects upon the human system. Its capacity will be 250,000 gallons per day and the cost is expected to be in the vicinity of 50 cents per 1,000 gallons.

Plant No. 4 will be at Roswell, New Mexico. There, water will be used that has a hardness of 24,000 parts per million. A process will be used of forced vapor circulation with drop condensation.

Plant No. 5 will be located somewhere on the East Coast of the United States to work on waters of the Atlantic Ocean. The process will probably be an adaptation of natural freezing similar to one that has received considerable publicity for use by the new state of Israel.

Dr. Miller envisions an eventual cost of water

recovery by these methods approximating 30 to 35 cents per thousand gallons. This can be put alongside of an average distribution cost for American cities of 35 cents as estimated by the American Water Works Association.

The contaminated waters of the Potomac river flow into the Atlantic Ocean. And even the longest of rivers winds at last into the sea. The very processes of distillation and recovery which are being developed in the saline water program may offer the answer to many local water pollution problems with which your Conference will deal.

Disposal of Atomic Wastes

And may I remind you that the disposal of atomic wastes probably carries the ultimate threat in water pollution. Radioactive raindrops disturb not only water supplies but milk and growing crops. Even lead-lined boxes deposited at sea offer cause for concern—especially since bathysphere divers last summer discovered that fish living at the bottom of the ocean's deepest trench depend upon oxygen carried to them by deep-sea currents.

One of the staunchest supporters of the desalination program has been Senator Anderson, for many years chairman of the Joint Committee on Atomic Energy. His interest springs, in part, from his belief that what is developed in this program may be important to man's survival in an atomic age.

This program of desalting or demineralizing the great, ultimate reserves and storehouses of the world's water in the oceans and the underground reservoirs may seem so vast as to be discouraging as are some of the profit-protecting practices employed by industry and the topsy-grown habits of modern life which pollute our streams. But progress is being made.

Representative John A. Blatnik, of Minnesota, Chairman of Subcommittee on Rivers and Harbors of the House Public Works Committee.

(Excerpts)

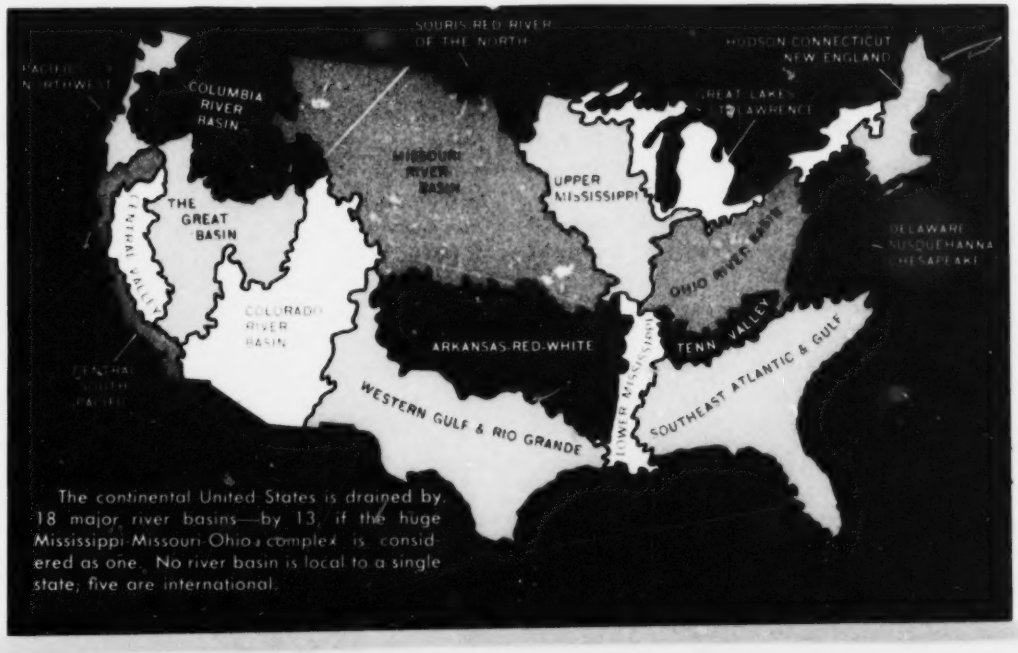
I plan to introduce extensive amendments to the Water Pollution Control Act when Congress convenes in January.

These proposed amendments will call for a) greater Federal research, b) expanded Federal enforcement jurisdiction, c) stepped-up Federal aid to communities for the construction of waste treatment plants, d) extended Federal grants-in-aid for State pollution control activities, and e) the establishment of an independent agency in the Department of Health, Education, and Welfare to handle Federal water pollution programs and activities.

The problem of water pollution has been too long ignored by all levels of government, by industry, and the public as well. Despite 12 years of Federal efforts, the pollution problem is worse than ever, costing the Nation over a billion dollars a year in lost resources.

Water pollution is no longer primarily a health problem. The control of pollution is a key aspect of the entire water resource problem. Effective pollution control is necessary to permit repeated reuse of water in the coming years when the demand will equal and exceed the supply.

Industry opposition to Federal pollution control legislation is short-sighted in view of industry's great need for water. Industry should cease its opposition to Federal grants to municipalities, especially in view of industry's support of tax benefits for themselves for the construction of industrial treatment facilities.



The continental United States is drained by 18 major river basins—by 13, if the huge Mississippi-Missouri-Ohio complex is considered as one. No river basin is local to a single state; five are international.

Representative William C. Cramer, of Florida, third-ranking minority member of the Subcommittee on Rivers and Harbors of the House Public Works Committee.

(Excerpts)

The Federal Water Pollution Control Act of 1956 is a "step in the right direction" but I plan to strengthen the Act by introducing amending legislation in the 87th Congress.

Amendments to the 1956 Act will have four principal objectives:

1. To strengthen State and interstate water pollution control programs.
2. To make more effective assistance to municipalities in the construction of necessary sewage treatment works.
3. To provide for more effective prevention and control of water pollution caused by Federal Government installations.
4. To strengthen the role of the Federal Government in abating pollution of interstate waters.

I intend to introduce legislation which would extend the provision for Federal grants to State and interstate water pollution control agencies for administration of their programs.

This legislation, if passed, would make it possible for several communities to get individual Federal grants and use these funds in the construction of a single sewage treatment facility.

I would make all interstate navigable waters and coastal waters subject to Federal abatement enforcement authority whether or not there is a showing of interstate pollution, if abatement action is requested by a State or municipality with the concurrence of the State, and I would also authorize the Secretary of Health, Education, and Welfare to issue orders in enforcement actions.

Discharges from Federal installations should be subject to administrative findings and recommendations in Federal water pollution abatement actions conducted by the Department of Health, Education, and Welfare.

I believe that these proposed amendments will provide an improved statutory base for the Federal-State water pollution control and abatement program.

With the shift of people from farm to city as the mechanization of farm operations has reduced the need for farm labor, it is almost trite to point out that we have become an urban Nation. What is of greater significance is that we are rapidly becoming a metropolitan Nation. Between 1950 and 1960, over 85 percent of the net increases in population occurred in metropolitan areas, and it is estimated that by the end of the century, only about five percent, or perhaps 17 million people out of about 330 million, will live on farms.

With the area from Washington-Norfolk to Boston, Massachusetts, becoming largely a metropolitan area, it is obvious that even metropolitan water problems have become interstate problems, as have many other natural resources problems. This fact has recently given rise to numerous requests by States for interstate compact ratification legislation by Congress. Such compacts obviously are essential and can serve useful purposes in many instances.

Constitutionally the Federal Government's authority has traditionally been mere ratification, thus permitting the States to act under such interstate compact authority. Recently, legislation with the Northeast Compact Bills as an example, proposed a drastic deviation from established policies by providing for actual voting participation on such compact commissions by the Federal Government representatives, including the right of veto. This involves a very serious State-Federal relationship as well as constitutional questions which resulted in the Justice Department's opposing this approach last session.

Concurrently, with this growth of the metropolis, a rapid increase in personal income and in general living standards has taken place which has provided people with both far greater leisure time and means with which to enjoy it. The resulting trek to sun, sand, and sea has resulted in a boom in my own home state of Florida which today is not only stimulating enterprise to provide for all of these people who seek recreation and relaxation in a benevolent climate, but has induced efforts to develop new types of industry and commerce to provide economic opportunity on a year-round basis for our tremendous increase in population which this boom has brought about.

But these situations have brought about a most important bearing on our national water resources picture. Huge quantities of water of acceptable quality must, in the future, be provided for these areas. And of even greater significance, the waste products of these great congregations of people must be properly disposed of in such a way as not to foul our rivers, lakes and oceans, if they are to continue to supply not only water for municipal and industrial use, but for the support of fish and for the creation of environmental factors required if we are to enjoy our increasing leisure time.

Water Pollution And Our Changing Times

Effects of Pollution on the National Health, Welfare, and Economy

PANEL SESSION I—

DECEMBER 13, 1960

Chairman—Hon. Thomas A. McCann

Co-Chairman—Dwight F. Metzler

ASSESSING THE WATER POLLUTION PROBLEM—Dwight F. Metzler

Discussant—Theodore M. Schad

IMPACTS OF POLLUTION ON HEALTH —Dr. Robert A. Kehoe

Discussant—Dr. Russell E. Teague

IMPACTS OF POLLUTION ON FISH AND WILDLIFE, RECREATION, AND ESTHETIC VALUES—Seth Gordon

Discussant—Frank Gregg

Discussant—Mrs. E. L. Ozbirn

IMPACTS OF WATER POLLUTION ON INDUSTRY—Leland C. Burroughs

Discussant—Kenneth S. Watson

POLLUTION, THE PROBLEM OF EVALUATION—Irving K. Fox

Discussant—Andrew J. Biemiller

SUBCOMMITTEE REPORT,

Hon. Thomas A. McCann

Neither the extent nor the effects of water pollution are sufficiently known to permit precise agreement at this Conference on the topic assigned to Panel I, "Water Pollution and Our Changing Times: Effects of Pollution on the National Health, Welfare, and Economy." But an analysis of the papers and discussion indicates that the future quality of our water resource and the range of human needs the resource can serve can be as high or as low as we wish it to be, depending on the values we wish to protect and the price we are willing to pay.

Known threats to human health from water pollution under existing treatment levels are not seen as catastrophic by public health officials; but better knowledge of the short and long-term effects of pollutants may show dangers where none are now anticipated.

Certain minimum steps are indicated to minimize threats to public health from pollution: investigation of potential health hazards as an integral part of development of processes and products producing pollutants, and preservation of uncontaminated water supplies and regulation of waste disposal.

The information needed to protect public health can be obtained only by the combined efforts of public and private interests, inspired by a keen sense of responsibility for water quality. Government responsibility in fact-finding should be exercised in a strong and foresighted manner in order to provide sound bases for action programs. Examination of the public health consequences of technical and industrial processes must be a regu-

PANEL I SUBCOMMITTEE

Chairman: Hon. Thomas A. McCann, Mayor of Fort Worth, Texas

Co-Chairman: Dwight F. Metzler, Kansas State Board of Health; American Public Health Association; Chairman, Conference of State Sanitary Engineers

MEMBERS:

Leland C. Burroughs, Shell Oil Company

Irving K. Fox, Resources For The Future, Incorporated

Seth Gordon, Conservation Consultant, California State Department of Fish and Game

Frank Gregg, Izaak Walton League of America, Incorporated

Mrs. E. Lee Ozbirn, General Federation of Women's Clubs

A. J. Steffen, Wilson & Company, Incorporated; National Technical Task Committee on Industrial Wastes

Harry E. Schlenz, President, Pacific Flush Tank Company; Water and Sewage Works Manufacturers Association

Dr. Russell E. Teague, Kentucky State Department of Health; Association of State and Territorial Health Officers

PHS RESOURCE PERSONNEL:

W. E. Gilbertson

R. S. Green

J. R. Harlan

J. H. Svore

lar and necessary part of research and development. The eventual cost to our society of achieving hygienic security will be much less than the potential cost of dealing with the effects of pollution.

Effects on recreation and esthetic values are difficult to measure because the judgements on use of water for such purposes are subjective.

Impacts of pollution on fish and wildlife are extensive. The United States Fish and Wildlife Service has stated that the area of habitat rendered unproductive each year by pollution is greater than the habitat established by all public agencies conducting wildlife restoration programs.

Industry's Water Needs Vary

Impacts of water pollution on industry are difficult to generalize upon because of the almost infinite variety of industrial uses. The largest industrial use is for cooling, where a wide tolerance in quality is permissible. In food and pharmaceutical manufacture, on the other hand, standards well above those for drinking water may be necessary.

Industrial management does not often seek public action to protect its water supply; it is reported as inclined to accept the burden of treating the water it needs for its processes. Industrial management, for the most part, believes that pollution of industrial water supplies will not increase to more critical levels in the near future. Water quantity and quality are important in plant location decisions; so is the extent and cost of pollution abatement which is likely to be required of industry.

The problem of evaluating pollution—of finding acceptable ways of comparing costs and benefits—is very difficult, but must be resolved if specifics are to supplant generalities as a basis for the establishment of sound public policy. Documentation of pertinent kinds of water quality deterioration is necessary. The prime difficulties are that various pollutants cause varying kinds of water supply deterioration, and measures of pollution effects vary with the values being considered. A pollutant damaging to recreation may be harmless to industrial users.

A precise definition of the different kinds of values with which we are concerned is essential. At least three kinds of values must be considered—health values, recreation values including esthetic values, and market values. The relative importance of these values will vary with changing demands.

Measurement of physical and biological relationships—to relate water quality to volume, temperature, etc., as well as to the usual problems of waste disposal—is essential.

In consideration of the impacts of water pollution on our changing times, the subcommittee members assigned to Panel I have prepared a series of recommendations designed to protect and enhance the values of the water resource. The subcommittee believes that the following recommendations are reasonable and warrant vigorous implementation:

1. We recommend that the Conference express its conviction that the goal of pollution abatement is to protect and enhance the capacity of the water resource to serve the widest possible range of human needs, and that this goal can be approached only by accepting the positive policy of keeping waters as clean as possible, as opposed to the negative policy of attempting to use the full capacity of water for waste assimilation.

2. There is need for a more systematic approach to the evaluation of water pollution problems, to include health, esthetic, and market values. A framework for analysis must be developed which will provide a relatively precise understanding of benefit-cost and which will form the basis for the design of public policies and programs for effective water quality management.

3. States should develop water monitoring programs for bacteriological, biological, chemical, physical, and radiological quality. This work should be coordinated with the efforts of an expanded National Water Quality Network of the Public Health Service. More data should be collected on the condition of streams both before and after water pollution abatement.

4. The construction of municipal waste treatment facilities should be expanded immediately with continued increases to keep up with population growth and to abate the backlog of pollution by 1970. A similar program expansion should be applied to the wastes from industry.

5. Each Federal installation should be required by Congress to treat its wastes in accordance with the standards for cities and industries in the area, with 1964 set as the target date for providing minimum treatment.

6. It is recommended that improved methods be developed for measuring pollution abatement progress. New engineering parameters which encompass all pollution components, as well as yardsticks for measurement of stream quality, are critically needed.

7. The administrative level of the Water Supply and Water Pollution Control activities in the Pub-

lic Health Service and in the States should be commensurate with the importance of this problem.

8. We recommend that public policy formally recognize the recreation value of our water resources as a full partner with domestic, industrial, and agricultural values in water quality management policies and programs.

9. We recommend that appropriate public and private agencies mount and sustain an expanded program of public information to the end that enlightened public opinion can be brought to bear on the accomplishments, costs, needs, opportunities, and problems involved in water quality management, noting that this Conference should provide a dramatic opportunity to launch such a program.

10. It is recommended that the Public Health Service assume leadership, in collaboration with other public and private agencies, in collecting, compiling, and publishing pertinent data on the toxicity of water contaminants. This should include criteria, standards, methods of testing, and safe allowable concentrations for human consumption; also that efforts be made to stimulate toxicological and epidemiological studies to be made to determine long and short-range effects.

11. In order to facilitate assessment of the total pollution problem, it is recommended that particular attention be given to accelerating the collection of information on industrial waste loading. The Public Health Service should coordinate collection of this information on the national level.

12. The Conference feels that financial incentive should be provided to encourage industry to install needed waste treatment facilities. This may be accomplished by permitting industry, for corporate income tax purposes, to charge the cost of nonproductive waste water treatment facilities as an expense.

NOTE: During the discussion period following this report, there were a number of comments made with reference to Recommendation No. 1, especially referring to the policy of keeping waters as clean as possible as opposed to using the full capacity of water for waste assimilation. The Recommendation as written received general agreement in Panels I, II, III, although in Panel III two changes were suggested. These changes are indicated at the conclusion of the Panel III report.

Meeting the Growing Competition for Water

Pollution Control as a Means of Increasing Water Supplies

PANEL SESSION II—

DECEMBER 13, 1960

Chairman—Dr. E. A. Ackerman

Co-Chairman—Ray E. Lawrence

WATER QUALITY MANAGEMENT—A NATIONAL NECESSITY—Clarence W. Klassen

Discussant—Earle C. Hubbard

PRIORITIES FOR WATER USE—Harvey O. Banks

Discussant—Hon. Fred G. Aandahl

WATER QUALITY INTELLIGENCE—Thomas J. Powers

Discussant—Morrison B. Cunningham

RIVER BASIN AND MULTIPURPOSE PLANNING—James W. Woodruff, Jr.

Discussant—Hon. Clair Engle, United States Senator

Discussant—Eugene W. Weber

EFFECTS OF LAND USE AND TREATMENT ON POLLUTION—Carl B. Brown

Discussant—Gordon K. Zimmerman

PESTICIDES AND WATER POLLUTION—Dr. Clarence Cottam

Discussant—Dr. L. A. Dean

SUBCOMMITTEE REPORT

Dr. E. A. Ackerman

The members of Panel II regard their assignment as one of the more difficult at this Conference. An analysis of pollution control as a means of increasing water supplies requires a great deal of the information and expert knowledge which came forth in panels other than this. Our Panel's question is complex because we not only must know what the present dangers are but also what impacts various types of pollution will have in the future upon the Nation's water supplies. We must know what the future needs for water will be for specific purposes and total demands as they extend into the future. We must know how pollution control measures are to be handled, and how they will fit into our legal and administrative systems. This job of analysis is not one which we have taken lightly.

Participating with us in our Panel sessions and deliberations have been representatives from all major regions of the country. We have listened to lawyers, legislators, engineers, administrators, geologist biologists, and chemists. Included in these have been Federal Government officials, State government officials, municipal officials, and men from private industry, private foundations, and trade associations. Speaking for the Panel subcommittee, I should like to state its consensus in comments on three broad questions: (1) How much do we know about water pollution? (2) What can we see for the future? and (3) In areas where other water needs exist, or may be reasonably anticipated, what should be done to

PANEL II SUBCOMMITTEE

Chairman: Dr. E. A. Ackerman, Carnegie Institution of Washington

Co-Chairman: Ray E. Lawrence, Partner, Black & Veatch, Consulting Engineers; President, Water Pollution Control Federation

MEMBERS:

L. W. Cadwallader, Potomac Electric Power Company; Edison Electric Institute

Louis Clapper, National Wildlife Federation

Morrison B. Cunningham, Oklahoma City Water Department; American Water Works Association

Roger Hale, Conservation Foundation

Page L. Ingraham, Council of State Governments

H. Wayne Pritchard, Soil Conservation Society of America

David F. Smallhorst, Texas State Department of Health; State and Interstate Water Pollution Control Administrators

Gordon K. Zimmerman, National Association of Soil Conservation Districts

PHS RESOURCE PERSONNEL:

K. S. Krause

W. W. Towne

L. F. Warrick

minimize waste disposal demands upon water resources?

We already know more about pollution and pollution control than we put to practical use. As Mr. Powers observed in our session, there are many water quality intelligence programs in this country. These include those of the United States Geological Survey, the newly established National Water Quality Network under Public Health Service supervision, regional projects like the Ohio River Valley Water Sanitation Commission, and numerous others of a local information gathering nature by private industry and municipalities. Through these means we have a reasonably broad picture of stream contamination by microbiotic organisms as indicated by the coliform bacteria, and much specific knowledge of the inorganic and organic contaminants of industrial origin usually found in urban areas or in densely settled regions.

We have a reasonably good picture of the control of pollution from natural causes. Indeed the reduction of sediment in streams, and the control of undesirable dissolved solids in streams may offer major opportunities for water improvements.

Carl B. Brown of the Soil Conservation Service stated, ". . . . silt pollution is a major deterrent to the effective development of the water resources of most drainage basins in the United States." He further estimated that annual losses from silt pollution may be on the order of $350 million a year for the country as a whole. Mr. Brown also pointed out that substantial amounts of our reservoir capacity are lost every year from silt or sedimentation. He further noted that about two trillion gallons of water must be filtered annually to remove suspended silt. We know the sources of much of this sediment, and even the type of erosion which causes it. Within recent years even metropolitan areas have been adding their increment to the sediment load of streams, as suburban development has soared.

Yet there are many things which we do not know. According to Mr. Klassen, for example, adequate analytical methods do not exist to determine the quantitative presence in water of 400 new substances for washing clothes, cleaning cars, killing weeds, controlling insects, and other uses. According to Mr. Klassen and Mr. Cunningham, we need to accelerate research on viruses and means of their control as an additional safeguard to potable water supplies. Dr. Cottam pointed out that we do not even know the total consumption or production of all pesticides. Mr. Klassen observed that present laboratory methods for determining water quality compliance are, in most instances, giving us nothing more than a history of conditions that existed one or more days previously. Methods are needed to determine what conditions are at a given moment so that better knowledge of hazards to water can be ascertained.

More Efficient Treatment Needed

Finally, treatment processes presently available for use in urban waste disposal are less than 90 percent efficient. For that reason, treated wastes cannot be discharged to receiving streams without deterioration of quality. Economically feasible "totally complete" treatment has not been been developed yet.

If there are gaps in our knowledge of the present, it can be expected that the gaps are even larger as we look at the future, the contours of which we need to appraise in answering the questions put to this Panel. Surprisingly, however, we do have some important information in this respect. Recent inventories of the relation of water resources to future demands indicate that on 22 major watersheds of the Nation five will show a deficiency of supply as compared to projected needs in 1980. This means that for these five basins there will be a demand for water which can be produced through the techniques of reuse or pollution control. Already some such water is in use in these basins. The greatest prospective deficiency occurs in the Southwestern States and it is there that quality control to permit water reuse becomes essential for future economic development. Before the end of the century, three more basins, the Western Gulf, the Upper Arkansas-Red River Basins, and the Western Great Lakes area are expected also to become deficient areas. On the other hand, most drainage basins east of the Mississippi and those on the Lower Missouri, the Lower Arkansas-White-Red, and the Columbia show adequate supplies, with proper conservation and normal control measures, even at the end of this century.

This situation does not describe many difficult sub-regional and local situations. The general outline is such that Mr. Banks stated, "We have reached the point where any use of water that does not give optimum economic and social return is wasteful. Maximum use with minimum quality deterioration must be our goal if we are to so budget our water expenditures that the available supply will be adequate to meet our growing needs."

Probably for this reason several endorse-

ments of comprehensive development were made. Descriptions were given of the process of comprehensive planning as it is now being carried on for the Southeastern river basins by the U. S. Study Commission, Southeast River Basins. Such development has progressed systematically within a few river basins, like the Columbia, the Colorado, the Central Valley, and the Missouri. Completed planning studies for comprehensive development have been made in additional basins as for the New England-New York basins, and those of the Arkansas-White-Red River basins. In addition to the Southeastern river basins, studies are in progress for Texas rivers and in the Delaware basin.

The progress of comprehensive development is of substantial interest to those interested in pollution control. It is basic to any knowledge of the extent to which pollution control will be needed as a source of water. Only through comprehensive planning can we obtain an estimate of total needs over a reasonable future period. Only through comprehensive planning can we obtain an intelligent picture of alternative sources to meet these needs. At least two speakers defined comprehensive development in terms of plans which aim at the maximum benefits for all purposes. One suggested that this be in terms of the maximum contribution to Gross National Product.

There is more to comprehensive development as it has been conceived by the speakers than engineering and technical organization. A legal and administrative structure which will permit the progress of such development and management is a question requiring serious attention. Even though comprehensive plans may be proceeding or have been finished for a number of important river basins, the legal support necessary to carry out comprehensive water management to the fullest needs study and attention. Our legal structure may or may not be compatible with the needs of comprehensive development. Thus the concept of water quality rights was introduced by Mr. Banks as almost certain to be a needed part of the legal structure of the future. In many of our States we now have water quantity rights, although not in all, but water quality rights need defining and legislative sanction.

It appears inevitable that as water quality deteriorates and interferes with established uses of water, litigation regarding water quality will increase in frequency and magnitude. Water quality rights therefore will achieve greater recognition and more precise definition.

In connection with these rights the question of water quality standards arose. Some speakers stated quite emphatically that no standards of water use could be applied to the entire country; indeed, that each community, or each river reach, presents an individual problem in water quality standards. Others felt that this may be a somewhat narrow interpretation of water quality criteria. There are certain standards which can be nation-wide, indeed, universal. Thus, our knowledge of pathogens can tell us what will make people ill anywhere, and permissible levels of radioactivity will be the same anywhere. However, there are a number of criteria which can be only locally or regionally.

Out of these and many other interesting and significant statements which were made in the course of Panel II sessions, the subcommittee has developed a few recommendations which it offers to the Conference.

The Panel recommends the following measures to facilitate the control of pollution in the Nation's streams and underground waters:

1. Comprehensive Development

Planning for the comprehensive development of each major basin or water resource area should be established as a fixed national policy. By comprehensive development we mean the application of integrated multiple-purpose design, planning, and management which include the joint consideration of ground and surface waters, systematic conservation by water users, and the treatment and management of waters having substandard quality. Consideration of every appropriate technique would be a routine part of planning for such development.

Such planning, insofar as feasible, should include consideration of all important industrial plant sites. An early and important objective should be a systematic program of flow regulation.

State initiative toward comprehensive planning should be encouraged, and participation by all major interests should be encouraged. The objective should be one of eventually producing maximum total benefits from all economic and social uses.

2. Reservoir Site Acquisition

Provision should be made, legally and financially, for the identification and acquisition at an early date of reservoir sites needed in the execution of comprehensive plans. The mounting population, the spread of settlement, and general intensification of valley land use otherwise may make many good sites totally unavailable or prohibitively costly.

3. Water Quality Criteria

Provision should be made within the Public Health Service for developing the water quality criteria which are suited to application on a national basis. However, many water quality criteria are not uniformly applicable because of the effects of area usage differences, stream characteristics, and other factors. State and local determinations of some criteria also will have to be made. It is recognized that periodic revision of these criteria not only will be in order, but should be sought, as new data are made available.

4. Water Quality Monitoring

Enlargement and extension should be made of the water quality monitoring programs now in effect, so as to reveal more adequately conditions, existing and future, in rivers and streams. We believe that the protection of the public health and the preservation of water supply sources for accepted beneficial uses require such extension and enlargement.

5. A National Credo

We recommend the adoption of a national *credo*, to be given as wide and consistent publicity as is feasible. The content of the credo would be: (a) Users of water do not have an inherent right to pollute; (b) users of public waters have a responsibility for returning them as nearly clean as is technically possible; and (c) prevention is just as important as control of pollution.

6. Basic Research

It should be regarded as an obligation on the part of industry to undertake basic research which will determine the biotic and other effects influencing the public welfare of the products they distribute. This should apply to detergents, insecticides, pesticides, herbicides, fertilizers and other microchemicals and microbiologicals, and to the effects of metallic wastes such as compounds of chromium and cyanide. Where the effects of these or other health hazards or potential public nuisances are not adequately treated within industry, the Federal Government or the States must provide for and budget such research. Additional research of peculiar public responsibility includes the effect and interpretation of reducing anaerobes, nitrifying bacteria, viruses, protozoa, and other biota, and radiation hazards.

7. Sediment and Salinity Control

The value of soil conservation, sediment control, and salinity control as pollution abatement measures should be recognized through planning and budget in our National, State, and local resource development programs. They should be considered as tools to be applied in water development and management. Pollution abatement is a problem with roots in rural land use and agronomy, as well as in urban congestion and industrial growth.

NOTE: During the discussion following the presentation of this report, questions were raised concerning the implications of some of these recommendations. Although no changes were made in the report by the Chairman, he explained the intent of the recommendations in some detail. This explanation will be included in the Proceedings of the Conference.

Keeping Water Clean

Responsibilities of Government, Industry, and the Public

PANEL SESSION III—
DECEMBER 13, 1960

Chairman—Dr. Abel Wolman

Co-Chairman—Milton P. Adams

THE NEEDS AND OBLIGATIONS OF FEDERAL AGENCIES—Robert A. Forsythe

THE NEEDS AND OBLIGATIONS OF INTERSTATE AGENCIES—Edward J. Cleary

THE NEEDS AND OBLIGATIONS OF STATE AGENCIES—Karl M. Mason

THE NEEDS AND OBLIGATIONS OF METROPOLITAN AGENCIES
Municipal—Justus H. Fugate
County—M. James Gleason

THE NEEDS AND OBLIGATIONS OF PRIVATE INDUSTRY—Leonard Pasek
Discussant—James M. Gill

PUBLIC AWARENESS AND CITIZEN RESPONSIBILITY—R. G. Lynch
Discussant—Mrs. Arthur E. Whittemore
Discussant—David B. Lee

FINANCING ASPECTS OF WATER POLLUTION CONTROL—Frank E. Curley
Discussant—Robert F. Boger

LEGAL ASPECTS OF WATER POLLUTION CONTROL—Chester S. Wilson
Discussant—Richard T. Sanders

SUBCOMMITTEE REPORT

Dr. Abel Wolman

Panel III has as its principal objective a comprehensive study of the various problems involved with "Keeping Water Clean." This broad subject included the responsibilities of government, industry, and the public in controlling the rising volume of pollution in the Nation's rivers and streams.

In opening the session on the not so innocent theme of "Keeping Water Clean," the panel chairman posed several questions as a framework upon which the discussion might evolve. These questions were not intended to cover all of the problems, but they were designed to point up some of the issues which are associated with the subject of keeping water clean. They are listed as follows:

1. How clean should the Nation maintain its rivers and streams; for what purpose; and at what price?

2. What are the responsibilities of private industry, as well as the local, state, and Federal governments in keeping water clean?

3. How can public sentiment be created and maintained as part of the continuing fight against water pollution?

4. Who is to pay for the stepped-up program against water pollution?

5. What are the inadequacies of various water pollution control laws, and what should be done to strengthen these laws?

The Subcommittee, following the formal panel session, pursued these questions at considerable length in order to arrive at a set of recommenda-

PANEL III SUBCOMMITTEE

Chairman: Dr. Abel Wolman, The Johns Hopkins University

Co-Chairman: Milton P. Adams, Michigan State Water Resources Commission

MEMBERS:

Robert F. Boger, Publisher, *Engineering News-Record*

Lloyd E. Partain, National Association of Manufacturers of United States of America

Edward J. Cleary, Ohio River Valley Water Sanitation Commission

Harry Cornell, International Association of Game, Fish, and Conservation Commissioners

George H. Taylor, AFL-CIO

Justus H. Fugate, American Municipal Association

C. R. Gutermuth, Natural Resources Council of America

David B. Lee, Conference of State Sanitary Engineers

John S. Samson, Nebraska State Water Pollution Control Council

J. V. Whitfield, North Carolina Department of Water Resources

Mrs. A. E. Whittemore, League of Women Voters of the United States

PHS RESOURCE PERSONNEL:

J. T. Barnhill
J. J. Flannery
D. H. Howells
Murray Stein

tions which would be acceptable to the varying points of view represented at the session.

Panel III developed a set of six broad recommendations which spelled out the responsibilities of government, industry, and the public in keeping the Nation's rivers and streams clean. These are as follows:

1. We recommend that the Conference express its conviction that the goal of pollution abatement is to protect and enhance the capacity of the water resource to serve the widest possible range of human needs, and that this goal can be approached only by accepting the positive policy of keeping waters as clean as possible as opposed to the negative policy of attempting to use the full capacity of water for waste assimilation.

2. Administration of water pollution control programs on state and interstate streams should continue to be the responsibility of the state agencies which therefore must be supported by adequate budgets and staffed by competent directors, engineers, scientists, and related professional personnel. It is essential that State legislatures appraise more realistically their opportunities and responsibilities in carrying out the principle herein stated and are urged to take appropriate action where necessary.

3. The Federal Government has clear responsibilities in its working relationship with State and local governments with respect to: research, leadership in personnel training, regulatory procedures, water resources inventories and investigations, and standards of water quality.

No agreement was reached among the conferees as to the extension of authority of the Federal Government in the area of water pollution control.

4. The Federal grants-in-aid program has provided a valuable stimulus to the control of stream pollution. Other methods of financing construction of sewage and waste treatment works deserve thorough study and investigation to determine the most appropriate means available or which might be made available for sound and equitable allocation of costs. Several other means of financing were suggested in one or two papers presented at the Conference. The view of the Panel Subcommittee was that these should be listed and appraised without any commitment on the part of the Subcommittee as to which, if any, should be recommended. It did suggest that these and others unnamed should be explored at some subsequent time:

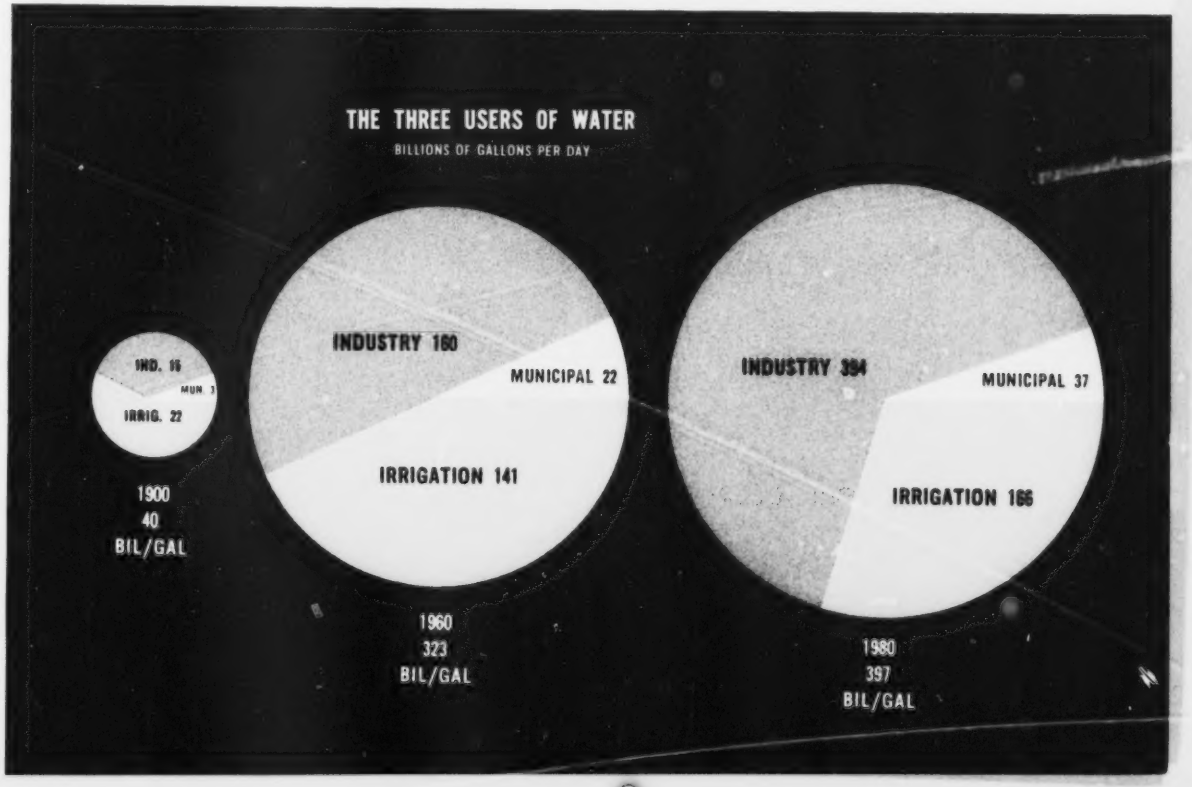
(a) Incentive grants from Federal and State appropriations;

(b) Guaranteed bonds;

(c) Revenue bonds;

(d) Marketing long-term revenue bonds under a Federal system of guarantees such as FHA-guaranteed mortgages or loans for defense production purposes;

(e) The creation of a "Water RFC" or such Federal finance agency to discount, purchase, or collateralize such bonds for loan purposes; and



(f) The earmarking of specific taxes, notably from Federal licensing of pleasure boats and sale of fuel to all water-borne craft, for water pollution control purposes.

5. The Panel agreed that state statutes and organizational structures for water pollution control should be reviewed and strengthened or revised where necessary. The following revisions were proposed in the suggested 1950 State Water Pollution Control Act as a guide for State legislation in this field. The proposals were: (a) Vest comprehensive authority in the State water pollution control agency, which would be given independent status in its organizational placement in State government; (b) Insure construction of municipal treatment facilities ordered by the State agency by authorizing courts to direct all necessary steps, including bond issues, tax levies, and revenue charges, if required; (c) Authorize the establishment of sanitary districts to deal with local pollution control problems beyond municipal limits.

The Panel did not arrive at an agreement on these proposals.

6. There was general agreement that the public needs more information on pollution and its abatement. Government agencies and other informed individuals should make every effort to present the facts in understandable form for use by individuals, organizations, and the general media of communication. Such material should include factual information and suggested methods of attack as have been discussed by the Conference.

NOTE: In making his report, the Chairman of Panel III indicated that some members of his panel subcommittee suggested that Recommendation No. 1 originally proposed by Panel III should be deleted, and that Recommendation No. 1 made by Panel I on this same subject be substituted in its place. The recommendation suggested for deletion read as follows: "The National goal with respect to stream protection should be the safeguarding of water quality. Every stream should be made to provide for the fullest range of uses for the type of society served and consistent with the variabilities within and among different basins."

It was suggested that Panel I's recommendation should be amended to include the concept of economic feasibility. The subcommittee reported that although there was no objection to including this concept in the recommendation the limited time available did not permit agreement on the exact phrasecology and recommended returning to the original proposal to delete Panel III's version of Recommendation No. 1 and to substitute that of Panel I.

The National Technical Task Committee on Industrial Wastes further suggested that Recommendation No. 1 should be modified to express the conviction of the Conference that the control of pollution is intended:

a. To protect and enhance the capacity of the water resources to serve the widest possible range of human needs, and

b. That this goal can be approached only by accepting the policy of keeping water clean, consistent with the variabilities within and among different river basins.

Research and Training

Critical Needs for Research, Resources, and Training

PANEL SESSION IV—
DECEMBER 13, 1960

Chairman—Dr. Gordon M. Fair

Co-Chairman—Dr. Charles A. Bishop

CRITICAL RESEARCH NEEDS—Environmental Aspects—Dr. Erman A. Pearson

Discussant—Dr. Clair S. Boruff

CRITICAL RESEARCH NEEDS—Medical Aspects—Dr. John A. Zapp

Discussant—Dr. Chauncey D. Leake

RESEARCH AND TREATMENT TECHNOLOGY—Dr. Rolf Eliassen

Discussant—Richard Hazen

RESOURCES FOR RESEARCH AND TRAINING—Dr. R. Keith Cannan

Discussant—Dr. G. A. Rohlich

THE POLITICAL-ECONOMIC RESEARCH CHALLENGE—Dr. Karl Brandt

Discussant—Dr. Gilbert F. White

SUBCOMMITTEE REPORT

Dr. Gordon M. Fair

The awareness of American public authorities to water pollution reaches back no more than the Biblical span of man's life. Then, towards the end of the 19th century, as today also, it was the growing urbanization and industrialization of the Nation that forced the attention of the public to the need "for protecting the purity of inland waters". Then, as today again, it was recognized that the problems of water pollution were so complex, so varied, and so many that existing knowledge was not enough for their solution, that existing knowledge would have to be expanded in pace with the quickening water requirements of the country, and that only by the synthesis of a great variety of subjects "requiring for its achievement the organic cooperation of specialists under inspiring leadership", would satisfactory progress be attained. Then, as today, therefore, it was realized that investigators were wanted to carry on the necessary research, that money and facilities were essential to the success of a research program, and that men were wanted, too, for leadership in reducing the discoveries of the laboratory to practice.

First, the State and, later, the Federal Government were asked to conduct fundamental and applied research in laboratory and field on the relation of water pollution to the development of water resources for municipal and industrial uses, and on the sanitation of water supplies for the prevention of enteric disease.

The achievements of the generation that accepted that challenge were magnificent; so great were they, indeed, that by the end of the first

PANEL IV SUBCOMMITTEE

Chairman: Dr. Gordon M. Fair, Harvard University

Co-Chairman: Dr. Charles A. Bishop, U. S. Steel Corporation

MEMBERS:

Dr. John C. Geyer, The Johns Hopkins University

Dr. Richard D. Hoak, Mellon Institute; Engineers Joint Council

Felix E. Wormser, Chamber of Commerce of the United States

PHS RESOURCE PERSONNEL:

B. B. Berger

H. A. Faber

third of the 20th Century, the machinery of public water control could settle down into the grooves of, more or less, complacent routine. Then came "the great leap forward" in population, and in science and industry. Faster than seemed believable, the industrial revolution of our age intensified the competition for water and, at the same time, its degradation by ever-growing and ever-varying pollutants, ranging from thermal factors through inorganic substances to organics of such construction that they cannot be metabolized by the scavenging hosts of microorganisms.

Parenthetically, it is these biological workmen to which we look for returning our lakes, streams, and tidal estuaries to natural cleanliness by themselves, or for removing even the most fractious substances committed to water by household or factory, in treatment works constructed so as to provide the most favorable environment for the operations of these beneficent microorganisms.

More Specialists Needed

Once again, therefore, we are confronted by great changes; changes that demand of us the concurrent creation in adequate numbers of specialists and leaders and stimulation of research, that through analysis, synthesis, and reduction to practice will develop the technological support of pollution control that is promising of success today. To provide the sophistication necessary for a successful discussion of resources, research, and training for water pollution control in our times, the roster of specialists that was attached to Panel IV included not only engineers, but biologists and chemists, physiologists and toxicologists and economists and political scientists and, according

to Dr. Gilbert White, we may have missed the boat by not including geographers and anthropologists—not only figures from universities and government agencies, but also leaders in industry and men of affairs.

It follows that a very wide spectrum of talent considered the problems that we face in research and training for water pollution control and brings its report to this meeting.

The outlook for research is most promising because there has been "a revolution in science" as well as "a scientific revolution." To draw a distinction between these two concepts that, otherwise, would seem to be identities, it should be explained that the scientific revolution has brought us new products and capabilities that are changing our mode of life and our environment, whereas the revolution in science is unifying the scientific disciplines and making it possible for scientists to understand one another's problems and to cooperate in their solution in radically new ways.

A striking example of the scientific revolution, as Professor A. E. Kennelly, whose name is attached to the Kennelly-Heaviside layer, now generally called the ionosphere, used to suggest, is the fact that we can send a message around the globe in the time it took for the cry "land ahead" of the lookout on Columbus' ship the *Pinta* to reach the helmsman's ear.

Revolution in Science

To exemplify the revolution in science, we need merely to attempt to define the boundaries between the formerly well established compartments of science, labelled physics, chemistry, and biology. Today we find it largely impossible to answer a question such as "where does physics stop and chemical physics begin?" Or, to continue, where shall we draw the line between chemical physics and physical chemistry; between physical chemistry and chemistry; between chemistry and biological chemistry; between biological chemistry and chemical biology; between chemical biology and biology; between biology and physical biology; between physical biology and biological physics; and, to come full circle, between biological physics and physics?

The destruction of the barriers between the sciences, not by inter-disciplinary or cross-disciplinary cooperation, but by the fusion of the disciplines themselves, is illustrated by the report that a Nobel Prize winner in physics plans to direct his future work into biology. Such indeed is the nature of the revolution that is taking place

in science itself. In a sense, therefore, we have become, as a group, like medieval man who as a natural philosopher aimed at the mastery of all human knowledge.

Mathematical Concepts

Because of this great change in science, we can look forward with assurance to the solution of almost any problem. Among our least realized capabilities, it should be noted, is the utilization of developing mathematical concepts. Whereas the time lag between the discovery of scientific principles and their utilization has been narrowed progressively, the backlog of mathematical ideas has continued to mount. The promise of progress, therefore, remains great.

But let me turn to the specific report of the findings and recommendations of Panel IV.

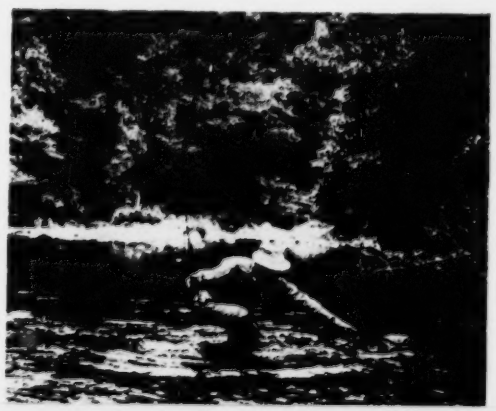
The panel, as you will see, from the report itself, brings in certain recommendations and supports these by certain factual material. Since I do not have the time to read the entire report, I shall confine myself to reading the recommendations of the panel and indicating, insofar as time allows, the nature of some of the supporting statements.

Our first recommendation is related to the flow of engineers and scientists.

1. The flow of engineers and scientists who are competent to advance and administer the scientific, technological, and economic conservation of our water resources, including, in particular, the control of water pollution, must be increased promptly by recruitment and training of basically qualified personnel at two levels: (a) the professional or predoctorate level; and (b) the postdoctorate level.

Now, the reasons for this are that we do not have enough engineers. We do not have enough men in the chemical, physical and biological sciences to deal with the problems that we face. We must reach over into already established scientific disciplines and entice individuals to come over into our field: very much as Dr. Glazer is being enticed by his own interests into the field of biology, we need to bring people from chemistry and biology and the social sciences and mathematics into our particular area.

There are about 5,500 practicing sanitary engineers of whom about two-thirds (3,700) are engaged in the development and control of water resources. It is estimated that about 280 newly trained men are needed yearly to maintain present strength. This estimate is based on an assumed five percent loss per annum by retirement, death, or defection. About 100 additional men are needed annually to keep pace with the requirements of population growth, and 350 are wanted as soon as possible to ensure the accomplishment of urgently required technological advances. This implies doubling the professional population in 12 years and doing this in the face of growing competition for prospective scientific talent.



Work in this field demands, for the most part, training to the masters and doctorate levels. The current annual output of sanitary engineers is about 300, of whom only about 130 have earned a master's degree and fewer than 10 a doctorate. About 25 percent of these advanced students are trainees from foreign countries, leaving about 100 with significant education in depth for employment in the sanitary engineering fields in the United States. Obviously, this is too few even for current operations.

The universities of the Nation award 60,000 master's degrees per year. Of these, 5,400 are in engineering and 17,000 in the physical and biological sciences. Sanitary engineering is losing out badly in competition for professional talent, therefore. At the doctorate level the situation is even more disturbing. Of the 300-odd doctorates awarded annually in science and engineering, less than 10 percent have been in sanitary engineering.

Data are lacking on the existing numbers of qualified chemists, biologists, economists, and political scientists in the area of water resource development and conservation. However, both quantitative and qualitative estimates point to deficiencies that are at least proportional to, if not greater than, those in the engineering group.

The manpower needs for research are particularly acute. If research is expanded to an estimated requirement of $20 million by 1970 and if $20,000 will sustain one investigator for one year, about 1,000 investigators will have to work in this field. If 40 percent of these are to be engineers and 60 percent basic scientists, educational institutions will have to produce 400 sanitary

engineers and 600 basic scientists with academic training that qualifies them for research. The current output of only 6 to 10 doctorates in all branches of sanitary engineering is far short of meeting the need, and the competition for basic scientists is so great that a determined effort must be made to recruit needed numbers of research leaders in the respective fields related to water-quality control.

2. The capability of graduate schools or university departments of engineering and public health to produce a sufficient number of engineers and scientists who are able to deal effectively with the mounting problems of water resource control must be enlarged by support of staff, student body, and teaching and research facilities, as well as by grants-in-aid of research. Interdisciplinary reserach should be encouraged in particular. Because the use of personnel and the application of research lie in the public domain, the Federal Government must be expected to assume a substantial portion of the required financial burden.

A solid look at our graduate schools shows that they are not too well prepared for such a load. The capacity of 45 schools surveyed at different times including a series of direct interviews at 23 institutions show the following: Sixty-eight schools report the availability of graduate training in sanitary engineering. Of these, 36 offer training beyond the M.S. degree. Only 15 have averaged 3 or more M.S. and Ph.D. degrees per year since 1954. An additional 17 have averaged at least 1 but less than 3 per year. Eighteen of the schools have not granted any such degrees during this entire period. This is neither a balanced nor an efficient organization in a nationally vital area.

The following deficiencies in capacity for research and training are estimated to exist:

(a) A 38 percent increase in teaching staff, and operation at optimum level of enrollment, will provide less than half the expected annual requirements for personnel trained at the graduate level.

(b) The expectations of an increased requirement of nearly twice the present research activity is dependent upon acquiring both the added personnel for teaching and the full-time research staff, or a total staff of 144.

(c) To provide the desired capacity for training and research will necessitate the addition of nearly 500 qualified persons for teaching and research.

Corresponding increases in research funds and facilities are required to sustain needed investigators and to provide them with technical support and equipment. Only a small fraction of the Public Health Service funds devoted to medical research is going into research for water supply and water pollution control—currently less than 1 percent. A committee of Congress has estimated that the national support of needed research could and should increase to about $3 billion by 1970, and that the Federal Government should expect to contribute about two-thirds of this amount. If we apply the same growth factor to research in water supply and water pollution control, we arrive at a national research budget of about $15 million, a major part of which would have to be financed by the Federal Government.

3. The flow of research findings on the water environment must be increased and intensified in depth as well as breadth.

Fundamental research is needed in many aspects of water pollution control including determination of the limits to which receiving bodies of water and biological as well as other treatment units can be safely loaded for the disposal of increasingly complex waste materials; identification of the role of water as a carrier of viral diseases, such as infectious hepatitis; and studies of long-range chronic effects of trace contaminants in water.

We need to increase our research effort on the behavior and fate of newly introduced organic contaminants; and newly recognized viruses. We need to develop more effective means of removing pollutants from water in municipal and industrial water treatment plants; more effective process controls of industrial waste discharges; better recovery or utilization of industrial process wastes;

and more sophisticated industrial waste treatment processes.

Water supply and pollution trends show that one of the most pressing problems in water quality management is the development of new treatment processes that will remove more of the contamination from municipal waste waters than present methods are able to do. Currently, large quantities of water must be made available to dilute and transport the residual wastes after treatment. When this water is not available, serious pollution hazards may result.

To discover and develop the required technologies will demand a major coordinated research program utilizing the best minds in the country and attracting physicists; physical, organic and biochemists; toxicologists; hydrologists; economists; geographers, and anthropologists who have not up to now been seriously engaged in water pollution research.

4. The flow of treatment-plant operating personnel as well as engineers and scientists working the wider field of water supply and water pollution control must be increased and their training broadened.

Two types of training are generally available: First, in-plant training of operating personnel for water and waste-water treatment works. This should be a requirement of all municip ! sewage treatment works, particularly of those benefiting from Federal aid. Second, academic training of such personnel. This is available largely through short-course programs and conferences in universities and colleges. This training is most desirable. However, the means and resources are quite limited in comparison with the number of technicians that will b. required within the next 15 years for pollution control purposes.

5. The field of water supply and pollution control has become so complex that we must think more generally than in the past, of a multi-disciplinary approach to the solution of developing problems. This implies the introduction of representatives of many disciplines including economists and political scientists, as well as applied mathematicians and physicists to this field and the creation of requisite institutes or centers for environmental health research at which needed personnel can be brought together.

Rapid changes and increasing complexity characterize our social and industrial growth. Research for the solution of today's problems calls for the group attention of scientists from the physical and biological sciences, sanitary engineering, applied mathematics and physics, and economics and political science. The making of headway is hampered by lack of communication with representatives of these areas. Unless a challenging program can be developed to encourage increased multidisciplinary attention to research in this area, we must be apprehensive of our ability to cope with environmental health problems that the technological advancements of the next several decades promise to bring.

Sample problems are: operations research or systems analysis of water resources developments including water quality control; integration of water purification and waste-treatment processes for maximum efficiency and economy; instrumentation for in situ, wide-scale, and longitudinal identification of pollution hazards and their control or prevention; automation of sampling and analysis of data; automatic computer control of treatment operations and warning systems for special hazards; and advanced methods of separation or destruction of solids in water. There are many others of like complexity and challenge that can be envisaged as lying before both in the immediate and more distant future.

6. The total national support for research in water supply and water pollution control should be increased substantially.

In research, funds and facilities are needed to sustain investigators and to provide them with technical support and equipment. Only a small fraction of the Public Health Service funds devoted to medical research is being applied to research in water supply and water pollution control—currently less than 1 percent. A committee of Congress has estimated that the national support of needed research in all fields of science and engineering could and should increase to about $3 billion by 1970, and that the Federal Government should expect to contribute about two-thirds of this amount. If we apply the same growth factor to water supply and pollution control, we arrive at a national research budget of about $15 million, a major part of which will have to be provided by the Federal Government.

NOTE: During the discussion that followed this report, it was suggested that a statement be included favoring the establishment of four Public Health Service Regional Laboratories for stream monitoring and applied research work. As an alternative it was suggested that laboratories be established at carefully selected universities. The Chairman concurred in this suggestion.

Closing Plenary Session

DECEMBER 14, 1960

Subcommittee Reports

Panel I—Hon. Thomas A. McCann

Panel II—Dr. E. A. Ackerman

Panel III—Dr. Abel Wolman

Panel IV—Dr. Gordon M. Fair

FEDERAL ROLE IN POLLUTION CONTROL

Hon. Arthur S. Flemming, Secretary, Health, Education, and Welfare

CONFERENCE SUMMARIZATION

Stuart Finley

RECOMMENDATIONS OF THE CONFERENCE

FEDERAL ROLE IN POLLUTION CONTROL

by Hon. Arthur S. Flemming

Secretary of Health, Education, and Welfare

I am happy to have the opportunity of participating in the first National Conference of Water Pollution.

I am delighted that through this Conference those who are interested in the advancement of fundamental and practical knowledge in this area and those who are interested in promoting action programs have had the opportunity of getting together under the auspices of the Federal Government.

As a result of the short but intensive education that I have had in this area over a period of the last two and a half years, I am convinced that action on many fronts is one of our Nation's most pressing needs.

I can assure you, however, that I will consider all of the Conference recommendations addressed to the Federal Government; and if it is possible for me to take future action designed to strengthen the role of the Federal Government in this area I will do so.

In addition, I believe that as a result of the privilege I have had of serving in this office, I will have an obligation as a private citizen to do everything I can to urge support for programs that are designed to strengthen the role of the Federal Government in this area.

In this closing address, therefore, I am going to identify the steps that, if taken, will enable the Federal Government to play the role it should play in dealing with the major national problem of water pollution.

Before, however, identifying some things that I believe should be done, I want to speak first of all about some of the things that should not be done. I refer to the proposal that some have made to transfer responsibility for the Federal Government's programs in the water pollution area from the United States Public Health Service.

I believe that such a move would result in progress in this area being retarded rather than accelerated. Here are my reasons:

- The Public Health Service over the years has recruited and trained for service in this area a group of unusually competent and dedicated public servants.
- The work of these men in the water pollution area has been integrated with the total program of the Public Health Service in such a manner as to enable them to draw on resources that could not possibly be duplicated at any other point in the Federal Government.
- The men who have moved to top leadership in the Public Health Service recognize that crusading for clean streams is one of their major responsibilities. This is reflected in the way in which they press both within the Executive Branch and on Capitol Hill for additional resources to discharge this responsibility more effectively.
- The career civil servants who play such an important role in the conduct of all of the programs for which the Department of Health, Education, and Welfare has responsibility recognize that the water pollution control area provides the Department with a unique opportunity for constructive service.

• There is no question in my mind but that future officials who are placed in top political positions in the Department will also propose and support programs of action in this area.

Now I want to identify what I am going to work for in an effort to make the Federal Government a more effective partner with the States, municipalities, and private organizations in the crusade to clean up the streams of the Nation.

• I believe that the Federal Government should continue to make available additional resources to the Public Health Service for the collection and dissemination of such information. The Federal Government's opportunity for leadership in this area is virtually unbounded. This leadership will rest on a solid foundation only if the Public Health Service is provided with the resources that it needs to bring together the facts on which action by government at all levels and by private groups can be based.

• I believe that the Federal Government should continue to make available additional resources for the conduct of research programs by its own personnel and for making grants for research and training projects and demonstrations to public and private agencies. The investment that has been made to date in this area has produced significant results. It is impossible to develop sound action programs to deal with many of the problems in this area because we have not yet, through research, identified the type of action program that will produce results. It is clear, therefore, that unless we do increase the resources that are available for research in this area, we are being penny wise and pound foolish.

• I believe that the Federal Government can very appropriately make additional resources available for giving technical assistance to State and interstate agencies. In transmitting a communication to the Congress last spring, I included in it this statement:

> "With the improved state programs that have been strengthened by Federal program grants, it has been possible for the Public Health Service to put more of its resources into the larger problems requiring assistance."

This statement, it seems to me, points up the fact that if we are willing to do more than pay lip service to the idea of State participation in these programs, we can get results.

• I believe that the authority which expires on June 30, 1961, to make grants to State and interstate agencies to assist them in meeting costs of establishing and maintaining adequate water pollution prevention and control programs should be extended for another five years. Furthermore, I believe that the annual appropriation authorization should be increased from $3 million to $5 million. Here again the Federal Government is provided with the opportunity of stimulating action at the State and interstate level which, if successful, will make unnecessary Federal involvement in direct operating programs in this area.

• I believe that the program under which the Federal Government has made grants available to localities to pay part of the cost of constructing municipal sewage treatment works has been a very successful program. I am impressed with the fact that during the period that this program has been operating, for every Federal dollar that has been spent, our municipalities have spent almost five.

• I believe that there should be an expansion of the activities of the Public Health Service in the area of developing comprehensive plans for water pollution control by major water drainage basins. These plans must, of course, be developed in cooperation with State and interstate agencies, municipalities, and industry.

• I firmly believe in the role of the interstate compact in dealing with this problem. I believe the Federal Government should continue to encourage and to lend assistance in the development of these compacts.

• I believe that steps should be taken to provide for more effective prevention and control of water pollution caused by Federal installations. A step can be taken in this direction by amending the enforcement section of the Water Pollution Control Act so as to provide that findings and recommendations of the hearing boards set up under the Act shall include specific recommendations relative to discharges from Federal property.

• I believe that the role of the Federal Government in abating pollution of interstate waters should be strengthened.

The enforcement procedures now included in the Water Pollution Control Act provide a mechanism for bringing into play the combined strengths of State water pollution control agencies, interstate agencies, and the Federal Government.

These procedures, however, are now authorized only for cases of pollution which are damaging to health or welfare of persons in a state other than a state of origin. I believe that these procedures should be made available also whenever there is pollution affecting legitimate uses of the waters of any navigable interstate stream, whether or not there is interstate pollution.

• I also believe that the Water Pollution Control Act should provide a mechanism for the initiation of enforcement procedures by a municipality adversely affected by water pollution. I also believe, however, that this avenue for remedial action should be limited to situations in which the Governor or State Water Pollution Control Agency has concurred in the municipality's request.

Likewise on the basis of my experience, I believe the Congress should clarify and strengthen the role of the Secretary of Health, Education, and Welfare in the enforcement process by providing that the findings and recommendations of the hearing boards shall be the Secretary's findings and recommendations except to the extent modified by him and providing for issuance of an order (instead of a notice) by him for abatement of any pollution found to exist. Parties of interest should be provided with the opportunity of appealing the order of the Secretary to the United States Court of Appeals.

• Finally, I believe that the definition of "interstate waters" in the Water Pollution Control Act should be amended so as to include all waters which flow across or from a part of State boundaries. Coastal waters would be specifically included within this definition.

In conclusion, I have been tremendously impressed by the team spirit that has been and is being displayed by all who are related to this major national problem. I do not think that there is any real argument over objectives. From time to time disputes arise as to the factual situation that confronts us and as to the best methods to follow in order to achieve our objectives.

My experience with the enforcement provisions of the Water Pollution Control Act convinces me that once a competent and respected body has provided interested parties with findings of fact and recommendations based on these facts, they are willing to go ahead and carry out the recommendations.

Industry is Complying

As far as I can recall, there is not a single instance where industry has failed to move in the direction of complying with the recommendations of these hearing boards.

Likewise, governmental bodies have shown a willingness to comply with these recommendations.

There is one exception to this generalization, namely, St. Joseph, Missouri, which is now being followed up in the courts.

Contrasted with this one situation, however, is the fact that voters went to the polls in November and approved bond issues totaling over $100 million for the construction of facilities which are needed in order to carry out the recommendations of these hearing boards.

The response that we have received as a result of action taken under the enforcement section is, in my judgment, a reflection of an increasing determination on the part of the people of this Nation to clean up our streams and waterways.

By your presence and by your participation in the Conference, you have made a major contribution to the achievement of this objective.

I look forward to the opportunity of continuing to work with you. I am confident that, working together, we are going to get results.

CONFERENCE SUMMARIZATION

by Stuart Finley
Documentary Film Producer

(Excerpts)

During this conference you have received about 250,000 words of prepared texts. They have been thrown at you in the individual panel sessions, and here in the main hall. When you get home, your associates, of course, are going to walk up to you and ask, "What happened?"

And I wonder how many of you have one succinct sentence that will describe what the lead story here is. I dare say that most of you have not analyzed it that thoroughly yet, and the process of assimilation certainly is going to take a while.

Permit me to summarize what I have seen and heard and read here. The measure of success of this Conference, as I see it, will be the degree to which what was said here influences your work in the coming years. I might add parenthetically that the Air Pollution Conference of a couple of years ago was talky, inconclusive, nonspecific, and yet many concrete activities of great value, stimulated by the public concern generated there, can be traced directly back to that meeting.

This National Conference on Water Pollution has developed 30 recommendations. Many of these were predictable in advance.

As you came here, you expected unanimous consent that pollution is bad and precisely this happened. Dr. Burney called it "a national disgrace." Mr. Lynch, of the *Milwaukee Journal*, called it a "galloping national disease." Mr. Fox, of Resources For The Future, Inc., put it realistically, when he said, "The word 'pollution' connotes evil; therefore, it must be opposed."

But disagreement comes on this point. How bad is bad? How evil is evil? or, as Mr. Gill put it, "How clean is clean?"

On this question there is a tremendous range of opinion, some of which was audible in quotations like these, for example from Panel II:

"We recommend the adoption of a national credo, to be given as wide and consistent publicity as is feasible. The content of the credo would be: (1) users of water do not have an inherent right to pollute; (2) users of public waters have a responsibility for returning them as nearly as clean as is technically possible; and (3) prevention is just as important as control of pollution."

Panels I and III came up with another, even more positive synthesis: "We recommend that the Conference express its conviction that the goal of pollution abatement is to protect and enhance the capacity of the water resource to serve the widest possible range of human needs, and that this goal can be approached only by accepting the positive policy of keeping waters as clean as possible, as opposed to the negative policy of attempting to use the full capacity of water for waste assimilation."

In sum, then, it would seem that we must amend our first area of agreement somewhat. The National Conference on Water Pollution is not unanimously against all pollution. But the accent should be on the positive—keep streams as clean as possible, rather than working them to death digesting wastes.

There was, of course, another view as expressed by Leonard Pasek: "To a very substantial extent, American industry—and thereby our economy—has been built upon the base of that valuable asset, the ability of our great waterways to dilute, assimilate and carry away industrial wastes."

Another question considered is "How well are we doing?" The answers brought out another range of opinion—"Corrective action is not keeping pace with the problem," and, "In the last few decades . . . industry for the most part has not only assumed its responsibility in the conservation and safekeeping of water supplies, but has done so at a faster rate than municipalities."

At the banquet on the evening of the first day's session you heard each of the four members of Congress outline their proposals to amend the Federal Water Pollution Control Act.

With all of the words uttered at this Conference, it is important to understand that the recommendations drawn up must necessarily be tentative. This is a political fact of life at the beginning of a new Administration. It is also an economic fact of life in a society in which the equations are constantly changing, being rebalanced.

While there are sharp divergent views on the methodology for accomplishing water pollution control, you stand agreed that it is a matter of vast and urgent concern. You stand agreed that the Federal Government, interstate agencies, municipalities, industries, and the general public must augment their present efforts, separately and jointly. You stand agreed, I think, that there is work enough for all and glory enough for all.

As you go back to your jobs, I hope it will be with a sense of urgency, and perhaps with a desire to change the question "Who's in charge?" to "How can we work together?"

Recommendations Of the Conference

1. That the conference express its conviction that the goal of pollution abatement is to protect and enhance the capacity of the water resource to serve the widest possible range of human needs, and that this goal can be approached only by accepting the positive policy of keeping waters as clean as possible, as opposed to the negative policy of attempting to use the full capacity of water for waste assimilation.

2. The adoption of a national *credo*, to be given as wide and consistent publicity as is feasible. The content of the credo would be:

   (a) Users of water do not have an inherent right to pollute; (b) users of public waters have a responsibility for returning them as nearly clean as is technically possible; and (c) prevention is just as important as control of pollution.

3. There is need for a more systematic approach to the evaluation of the water pollution problems, to include health, esthetic, and market values. A framework for analysis must be developed which will provide a relatively precise understanding of benefit-cost and which will form the basis for the design of public policies and programs for effective water quality management.

4. Planning for the comprehensive development of each major basin or water resource area should be established as a fixed national policy. By comprehensive development we mean the application of integrated multiple-purpose design, planning and management which include the joint consideration of ground and surface waters, systematic conservation by water users, and the treatment and management of waters having sub-standard quality. Consideration of every appropriate technique would be a routine part of planning for such development.

   Such planning, insofar as feasible, should include consideration of all important industrial plant sites. An early and important objective should be a systematic program of flow regulation. State initiative toward comprehensive planning should be encouraged, and participation by all major interests should be encouraged. The objective should be one of eventually producing maximum total benefits from all economic and social uses.

5. Provision should be made, legally and financially, for the identification and acquisition at an early date of reservoir sites needed in the execution of comprehensive plans. The mounting population, the spread of settlement, and general intensification of valley land use otherwise may make many good sites totally unavailable or prohibitively costly.

6. The value of soil conservation, sediment control, and salinity control as pollution abatement measures should be recognized through planning and budget in our National, State, and local resource development programs. They should be considered as tools to be applied in water development and management. Pollution abatement is a problem with roots in rural land use and agronomy, as well as in urban congestion and industrial growth.

7. That public policy formally recognize the recreation value of our water resources as a full partner with domestic, industrial, and agricultural values in water quality management policies and programs.

8. Administration of water pollution control programs on state and interstate streams should continue to be the responsibility of the State agencies which therefore must be supported by adequate budgets and staffed by competent directors, engineers, scientists and related professional personnel. It is essential that State legislatures appraise more realistically their opportunities and responsibilities in carrying out the principle herein stated and are urged to take appropriate action where necessary.

9. The administrative level of the Water Supply and Water Pollution Control activities in the Public Health Service and in the States should be commensurate with the importance of this problem.

10. That state statutes and organizational structures for water pollution control should be reviewed and strengthened or revised where necessary. The following revisions were proposed in the suggested 1950 State Water Pollution Control Act as a guide for State legislation in this field. The proposals were:

   a. Vest comprehensive authority in the State water pollution control agency, which would

be given independent status in its organizational placement in State government;

b. Insure construction of municipal treatment facilities ordered by the State agency by authorizing courts to direct all necessary steps, including bond issues, tax levies, and revenue charges if required;

c. Authorize the establishment of sanitary districts to deal with local pollution control problems beyond municipal limits.

Panel III did not arrive at an agreement on these proposals.

11. The Federal Government has clear responsibilities in its working relationship with State and local governments with respect to: research, leadership in personnel training, regulatory procedures, water resources inventories and investigations, and standards of water quality.

No agreement was reached among the conferees as to extension of authority of the Federal Government in the area of water pollution control.

12. That appropriate public and private agencies mount and sustain an expanded program of public information to the end that enlightened public opinion can be brought to bear on the accomplishments, costs, needs, opportunities, and problems involved in water quality management, noting that this Conference should provide a dramatic opportunity to launch such a program.

13. There was general agreement that the public needs more information on pollution and its abatement. Government agencies and other informed individuals should make every effort to present the facts in understandable form for use by individuals, organizations, and the general media of communication. Such material should include factual information and suggested methods of attack as have been discussed by the Conference.

14. The Federal grants-in-aid program has provided a valuable stimulus to the control of stream pollution. Other methods of financing construction of sewage and waste treatment works deserve thorough study and investigation to determine the most appropriate means available or which might be made available for sound and equitable allocation of costs. Several other means of financing were suggested in one or two papers presented at the Conference. The view of the Panel Subcommittee was that these should be listed and appraised without any commitment on the part of the Subcommittee as to which, if any, should be recommended. It did suggest that these and others unnamed should be explored at some subsequent time:

(a) Incentive grants from Federal and State appropriations;

(b) Guaranteed bonds;

(c) Revenue bonds;

(d) Marketing long-term revenue bonds under a Federal system of guarantees such as FHA-guaranteed mortgages or loans for defense production purposes;

(e) The creation of "Water RFC" or such Federal finance agency to discount, purchase or collateralize such bonds for loan purposes; and

(f) The earmarking of specific taxes, notably from Federal licensing of pleasure boats and sale of fuel to all water-borne craft, for water pollution control purposes.

15. The construction of municipal waste treatment facilities should be expanded immediately with continued increases to keep up with population growth and to abate the backlog of pollution by 1970. A similar program expansion should be applied to the wastes from industry.

16. That financial incentive should be provided to encourage industry to install needed waste treatment facilities. This may be accomplished by permitting industry, for corporate income tax purposes, to charge the cost of non-productive waste water treatment facilities as expense.

17. Each Federal installation should be required by Congress to treat its wastes in accordance with the standards for cities and industries in the area, with 1964 set as the target date for providing minimum treatment.

18. Enlargement and extension should be made of the water quality monitoring programs now in effect, so as to reveal more adequately conditions, existing and future, in rivers and streams. We believe that the protection of the public health and the preservation of water supply sources for accepted beneficial uses require such extension and enlargement.

19. In order to facilitate assessment of the total pollution problem, it is recommended that particu-

lar attention be given to accelerating the collection of information on industrial waste loading. The Public Health Service should coordinate collection of this information on the national level.

20. States should develop water monitoring programs for bacteriological, biological, chemical, physical and radiological quality. This work should be coordinated with the efforts of an expanded National Water Quality Network of the Public Health Service. More data should be collected on the condition of streams both before and after water pollution abatement.

21. Provision should be made within the Public Health Service for developing the water quality criteria which are suited to application on a national basis. However, many water quality criteria are not uniformly applicable because of the effects of area usage differences, stream characteristics and other factors. State and local determinations of some criteria also will have to be made. It is recognized that periodic revision of these criteria not only will be in order, but should be sought, as new data are made available.

22. That the Public Health Service assume leadership, in collaboration with other public and private agencies, in collecting, compiling, and publishing pertinent data on the toxicity of water contaminants. This should include criteria, standards, methods of testing, and safe allowable concentrations for human consumption; also that efforts be made to stimulate toxicological and epidemiological studies to be made to determine long and short-range effects.

23. The total national support for research in water supply and water pollution control should be increased substantially.

24. The flow of research findings on the water environment must be increased and intensified in depth as well as breadth.

25. That improved methods be developed for measuring pollution abatement progress. New engineering parameters which encompass all pollution components, as well as yardsticks for measurement of stream quality, are critically needed.

26. It should be regarded as an obligation on the part of industry to undertake basic research which will determine the biotic and other effects influencing the public welfare of the products they distribute. This should apply to detergents, insecticides, pesticides, herbicides, fertilizers, and other microchemicals and microbiologicals, and to the effects of metallic wastes such as compounds of chromium and cyanide. Where the effects of these or other health hazards or potential public nuisances are not adequately treated within industry, the Federal Government or the States must provide for and budget such research. Additional research of peculiar public responsibility includes the effect and interpretation of reducing anaerobes, nitrifying bacteria, viruses, protozoa, and other biota, and radiation hazards.

27. The flow of engineers and scientists who are competent to advance and administer the scientific, technological, and economic conservation of our water resources, including, in particular, the control of water pollution, must be increased promptly by recruitment and training of basically qualified personnel at two levels: (a) the professional or predoctorate level; and (b) the postdoctorate level.

28. The field of water supply and pollution control has become so complex that we must think more generally than in the past of a multidisciplinary approach to the solution of developing problems. This implies the introduction of representatives of many disciplines including economists and political scientists, as well as applied mathematicians and physicists to this field and the creation of requisite institutes or centers for environmental health research at which needed personnel can be brought together.

29. The capability of graduate schools or university departments of engineering and public health to produce a sufficient number of engineers and scientists who are able to deal effectively with the mounting problems of water resource control must be enlarged by support of staff, student body, and teaching and research facilities, as well as by grants-in-aid of research. Interdisciplinary research should be encouraged in particular. Because the use of personnel and the application of research lie in the public domain, the Federal Government must be expected to assume a substantial portion of the required financial burden.

30. The flow of treatment-plant operating personnel as well as engineers and scientists working in the wider field of water supply and water pollution control must be increased and their training broadened.

Conference Participants

The Steering Committee

This group was composed of highly qualified individuals representing municipal, state, interstate, industrial, civic, labor and women's organizations, and other citizens' groups having an interest in the water pollution problem.

Water Pollution Control Advisory Board

These outstanding public officials and leading business executives who are appointed by the President have been requested by the Surgeon General to assist in implementing the Conference recommendations as they apply to the Public Health Service.

Program Participants

These include Conference speakers, discussants, other program participants and Public Health Service staff.

CONFERENCE STEERING COMMITTEE

AMERICAN FEDERATION OF LABOR AND CONGRESS OF INDUSTRIAL ORGANIZATIONS—George H. Taylor

AMERICAN MUNICIPAL ASSOCIATION—Justus H. Fugate

AMERICAN PUBLIC HEALTH ASSOCIATION—Dwight F. Metzler

AMERICAN SOCIETY OF CIVIL ENGINEERS—Edward J. Cleary

AMERICAN WATER WORKS ASSOCIATION—Morrison B. Cunningham

ASSOCIATION OF STATE AND TERRITORIAL HEALTH OFFICERS—Russell E. Teague, M.D.

CHAMBER OF COMMERCE OF THE UNITED STATES—Felix E. Wormser; Alt., Richard W. Smith

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CONSERVATION FOUNDATION — Roger Hale; Alt., Stephen W. Blodgett and W. D. Bowman

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NATIONAL ASSOCIATION OF COUNTY OFFICIALS—Bernard F. Hillenbrand

NATIONAL ASSOCIATION OF MANUFACTURERS OF THE UNITED STATES OF AMERICA—Donald J. Hardenbrook; Alt., Daniel W. Cannon

NATIONAL ASSOCIATION OF SOIL CONSERVATION DISTRICTS—Gordon K. Zimmerman

NATIONAL COUNCIL FOR STREAM IMPROVEMENT—George E. Dyke

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NATIONAL WILDLIFE FEDERATION—Louis Clapper

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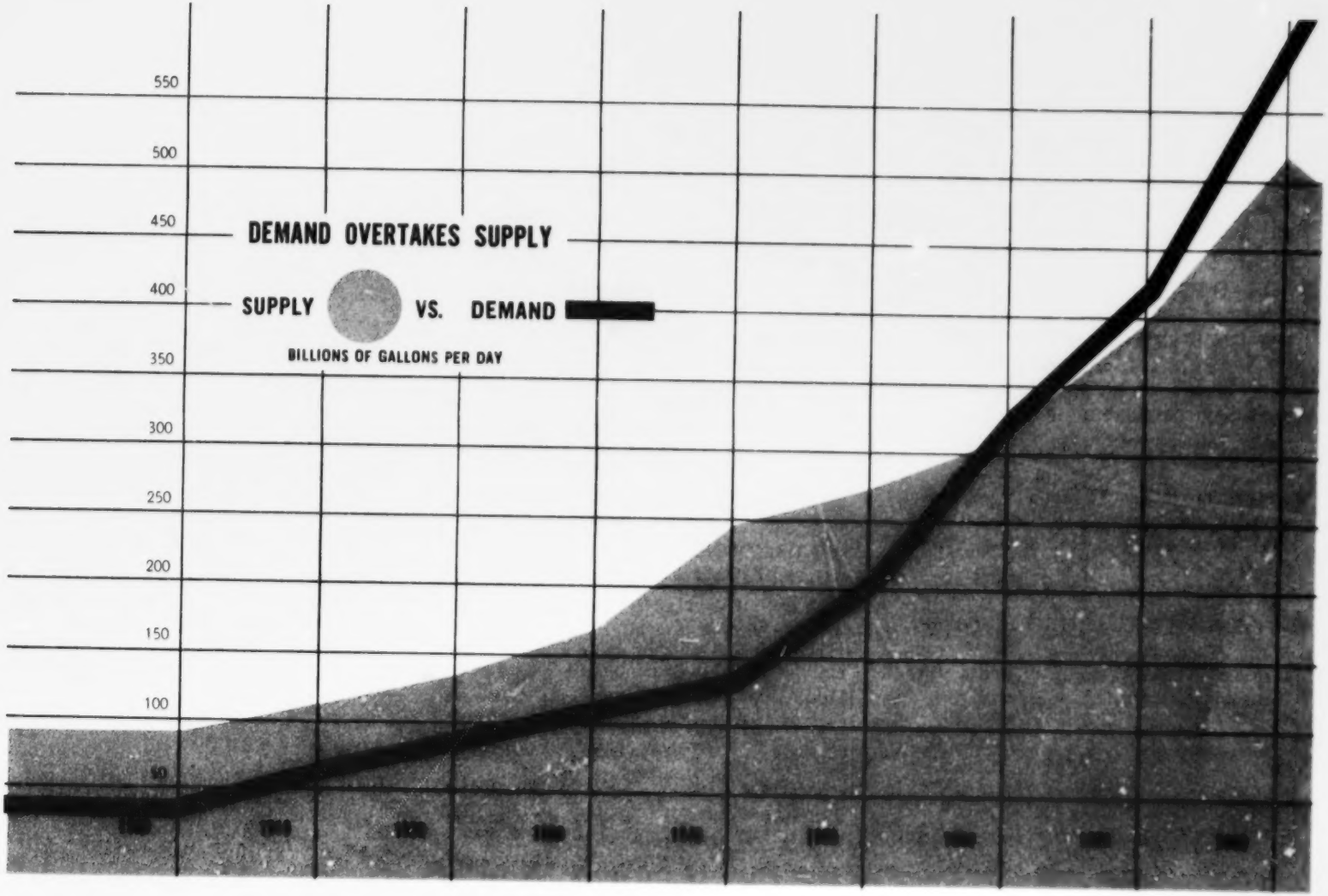

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